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THE POLYCLAD FLATWORMS OF THE ATLANTIC COAST OF THE UNITED STATES AND CANADA

By Libbie H. Hyman

Since the work of Girard and Verrill and the one paper by Wheeler in 1894, the polyclads of the Atlantic coast of North America have not been studied until recently, when the subject was simultaneously and independently attacked by Dr. A. S. Pearse, of Duke University, and myself. Pearse and his associates [1] published their work in three papers appearing in rapid succession which antedated my article on some of the same species (Hyman, 1939a). More recently I undertook this revision of all the Atlantic coast material contained in the collections of the United States National Museum, including the polyclads studied by Pearse, Littler, and Walker. Dr. Pearse himself furnished me with two shipments of live polyclads.

In the hope of discovering whole mounts mentioned by Verrill in his account of New England polyclads (1892–93), I made a trip to the Peabody Museum of Yale University and examined large numbers of Verrill's slides. Nothing of value, however, was discovered. Thanks are expressed to M. D. Burkenroad, assistant curator, for time and trouble expended in helping me with these slides.

The work of Pearse and his coworkers was based on whole mounts. These have now been studied in serial section, except in the case of one specimen, of which only the type was available. Unfortunately, Pearse's specimens were found to be in extremely bad histological condition, so that the sections were often unsatisfactory. It has nevertheless been possible to determine the status of practically every species.

[1] Pearse, 1938; Pearse and Littler, 1938; and Pearse and Walker, 1939.

The polyclads of the *Sargassum* are omitted here, as they are considered in full elsewhere (Hyman, 1939b).

Order POLYCLADIDA

Suborder ACOTYLEA [2]

Definition.—Polyclads without a sucker behind the female genital pore; tentacles when present of the nuchal type; eyes never in paired groups on the anterior margin; pharynx typically ruffled; copulatory complex generally in the posterior body half; uteri extending anterior to the female genital pore (but in a few families the pharynx is tubular and the copulatory complex may then be in the anterior half).

Section CRASPEDOMMATA Bock, 1913

Definition.—Acotylea with a band of eyes along the whole or the anterior part of the body margin; with cerebral and tentacular eye clusters in addition and sometimes also frontal eyes, or anterior end strewn with small eyes not arranged in clusters (eyes completely lacking in *Plehnia arctica*).

Family DISCOCELIDAE Laidlaw, 1903

Definition.—Craspedommata of oval form with marginal band of eyes limited to the anterior body half; tentacles absent; cerebral and tentacular eye clusters present; copulatory complex immediately behind the pharynx; male organ and wall of male antrum with numerous prostatic apparatuses; typical prostatic vesicle absent.

CORONADENA, new genus

Definition.—Discocelidae with a semicircle of 7–11 prostatic apparatuses around the male antrum; otherwise as in *Discocelis*.

CORONADENA MUTABILIS (Verrill, 1873), new combination

FIGURE 24, *a*, *b*

Polycelis mutabilis VERRILL, 1873, p. 746.

Discocelis mutabilis VERRILL, 1893, p. 493, pl. 40, fig. 7; pl. 42, figs. 6, 6*a*, 7.—PEARSE and WALKER, 1939, p. 16, fig. 1.

Discocelis grisea PEARSE, 1938, p. 67, fig. 22.—PEARSE and LITTLER, 1938, p. 235, pl. 20, fig. 1.

Material.—Ten whole mounts in Pearse collection labeled *Discocelis grisea*, including type; set of serial sections made from one of these;

[2] Pearse spells the names of the suborders Acotylina and Cotylina, in accordance with the terminology proposed by him in his brochure: Zoological Names, a List of Phyla, Classes, and Orders Prepared for Section F, American Association for the Advancement of Science, 24 pp., Duke University Press, 1936.

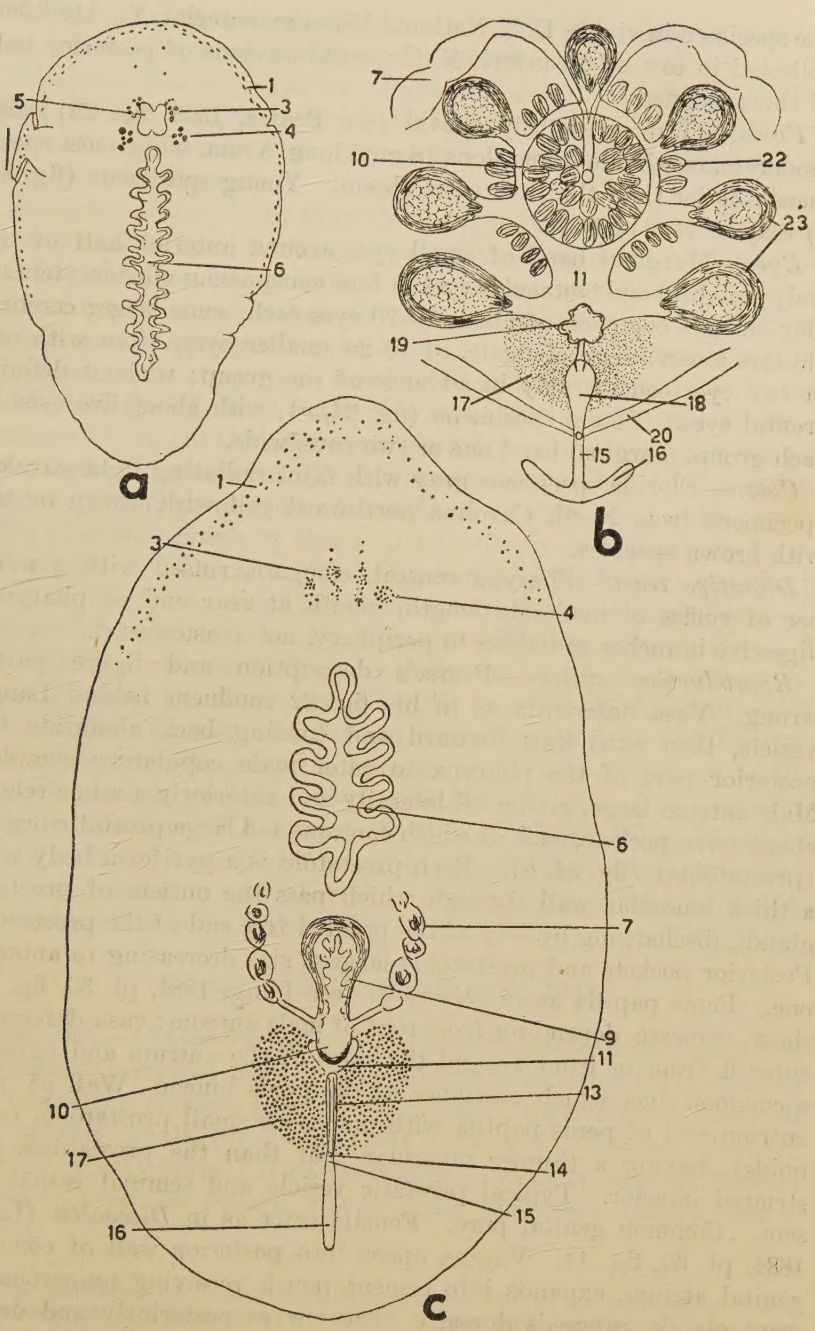

FIGURE 24.—*a*, *Coronadena mutabilis* (Verrill), young specimen, from one of Pearse's whole mounts; *b*, the copulatory complex of *C. mutabilis* viewed from above, constructed with the aid of frontal sections and whole mounts; *c*, *Discocelides ellipsoides* (Girard), from U. S. F. C. slide No. 15621. (See p. 492 for index to numbered parts.)

one specimen in vial in U. S. National Museum material, No. 118/156b, collected in tow off Beaufort, N. C.; serial sections of posterior half of this specimen.

Form.—Oval or slightly oboval (see Pearse, 1938, fig. 22); size moderate, maximum dimensions 18 mm. long, 5 mm. wide, most specimens smaller than this; tentacles absent. Young specimens (fig. 24, *a*) may be very obovate.

Eyes.—Marginal band of small eyes around anterior half of the body; cerebral and tentacular eyes in four conspicuous clusters; tentacular clusters compact, of about 10–20 eyes each, some large; cerebral clusters looser, more elongate, of 10–25 smaller eyes, often with one or two eyes considerably in advance of the group; without definite frontal eyes. Young specimens (fig. 24, *a*), with about five eyes in each group, marginal band one or two rows wide.

Color.—Florida specimens gray with faint radiating light streaks; specimens from North Carolina northward yellowish brown or tan with brown speckles.

Digestive tract.—Pharynx central, elongate, ruffled with a number of ruffles of moderate length, mouth at rear end of pharynx; digestive branches radiating to periphery, not anastomosed.

Reproductive system.—Pearse's description and figure partly wrong. Vasa deferentia as in his fig. 22 confluent behind Lang's vesicle, then extending forward and turning back alongside the posterior part of the pharynx to enter male copulatory complex. Male antrum large, giving off laterally and anteriorly a semicircle of about seven pockets, each of which contains 1–3 large prostatic organs (prostatoids) (fig. 24, *b*). Each prostatoid is a pyriform body with a thick muscular wall through which pass the outlets of prostatic glands, discharging by way of the pointed free end of the prostatoid. Posterior pockets and prostatoids largest, size decreasing to anterior one. Penis papilla as in *Discocelis* (see Lang, 1884, pl. 30, fig. 1), short, truncate, depending from roof of male antrum; vasa deferentia enter it from in front around the sides of the antrum and unite to a common duct which continues as the penis lumen. Wall of male antrum and of penis papilla with numerous small prostatoids (adenoids), having a thinner muscular coat than the prostatoids and striated interior. Typical prostatic vesicle and seminal vesicle absent. Common genital pore. Female tract as in *Discocelis* (Lang, 1884, pl. 30, fig. 1). Vagina opens into posterior wall of common genital atrium, expands into cement pouch receiving numerous cement glands, proceeds dorsally, then curves posteriorly and downwards and after receiving uteri opens into crescentic Lang's vesicle (called by Pearse "pair of transverse accessory uterine organs").

Distribution.—Florida northward to Massachusetts, rare in the northern part of the range.

Habits.—Active, changeable, among shells and algae in shallow water; also pelagic, swimming at the surface.

Neotype.—Pearse's type of "*Discocelis grisea*," U. S. N. M. No. 20186, selected as the neotype of *Discocelis mutabilis* Verrill, now *Coronadena mutabilis;* two sets of serial sections also deposited in U. S. National Museum.

Remarks.—As study of Pearse's specimens labeled *Discocelis grisea* showed that the species is not a *Discocelis* but requires a new genus of the Discocelidae, I have proposed the name *Coronadena.*[3] Pearse claims his new species *grisea* differs from *mutabilis* in color and eye arrangement. As regards color, it was stated by him that the species is gray with radiating light streaks (Florida specimens). In Pearse and Littler (1938), some are said to be of this coloration, but others (presumably North Carolina specimens) are described as gray around the margin and somewhat speckled tan in the middle. In Pearse and Walker (1939), the specimen from Cape Lookout, N. C., which was called *Discocelis grisea* by Pearse and Littler, is now said to be *Discocelis mutabilis.* My examination of specimens from Florida and North Carolina (including the Cape Lookout specimen, labeled *Discocelis grisea*) has failed to show the slightest difference between them. I have also been unable to find any difference in eye arrangement between Pearse's specimens and Verrill's figures and descriptions of *D. mutabilis.* Unfortunately it has not been possible to find Verrill's type specimen. The young specimens of "*Discocelis grisea*" in the Pearse collection are also very much like the young *D. mutabilis* taken in the tow off Newport, R. I., and Woods Hole, Mass., by Verrill in 1882. I am therefore of the opinion that *grisea* and *mutabilis* are conspecific and that the correct name of the animal is *Coronadena mutabilis* (Verrill).

Family PLEHNIIDAE Bock, 1913

Definition.—Craspedommata of oval or elliptical form and thick firm consistency; marginal band of eyes limited to anterior half; cerebral and tentacular clusters present, also usually some frontal eyes; all eyes notably small (eyes altogether lacking in *Plehnia arctica*); pharynx small, central; tentacles absent; accessory seminal vesicles present[4]; prostatic vesicle free[5]; penis unarmed; Lang's vesicle present.

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[3] Fuller description and illustrations of this genus and species were included in a paper I prepared for a Festschrift for Vejdovsky to be published in Prague. I read proof on this paper late in 1939, but have since heard nothing of it. Owing to conditions in Europe it is possible that it will never appear.

[4] Accessory seminal vesicles are expanded terminal parts of the vasa deferentia with definite muscular walls.

[5] The prostate is said to be free when it is not part of the male canal but opens into this by a duct.

Genus DISCOCELIDES Bergendal, 1893

Definition.—Plehniidae with large prostatic vesicle in which the glandular portion exceeds the muscular portion; vasa deferentia entering separately the neck of the prostatic vesicle; Lang's vesicle large, elongate.

DISCOCELIDES ELLIPSOIDES (Girard, 1854)) new combination

FIGURES 24, *c;* 25, *a*

Leptoplana ellipsoides GIRARD, 1854, p. 27, pl. 2, fig. 16 (not *L. ellipsoides* VERRILL, 1893).
Leptoplana folium VERRILL, 1873, pp. 487, 632.
Trigonoporus folium VERRILL, 1893, p. 487, pl. 41, fig. 5, 6; pl. 42, fig. 5; pl. 44, figs. 4–7.
Trigonoporus dendriticus VERRILL, 1893, p. 491, pl. 41, fig. 4; pl. 42, fig. 4; pl. 43, fig. 5.

Material.—One whole mount, U. S. F. C. No. 15621, labeled *Trigonoporus folium;* one whole mount, U. S. F. C. No. 14337, labeled *Leptoplana ellipsoides;* two unidentified vials, each with one specimen, in collection of U. S. National Museum; serial sections of posterior half of first specimen; anterior half remounted on original slide.

Form.—Elliptical, anterior end pointed, posterior more rounded (fig. 24, *c*); thick, firm; tentacles absent; maximum length, 20–25 mm., breadth 10–15 mm.; margins thin, flexible, undulated.

Eyes.—Marginal band limited to about anterior third; tentacular eyes in rounded clusters; cerebral eyes in loose elongated groups, which follow anteriorly the course of a pair of large nerve trunks (fig. 24, *c*); scattered frontal eyes may occur between cerebral groups and marginal band.

Color.—Flesh, yellowish, or yellowish brown with dendritic brown markings; reddish or pink tint on brain and main nerve trunks; white areas over pharynx and copulatory apparatus.

Digestive tract.—Pharynx central, small, short, with about five lobes on each side; mouth at about center of pharynx; intestine extremely dendritic, the branches anastomosed into a network with roundish meshes.

Reproductive system.—Male copulatory apparatus large, conspicuous, immediately behind the pharynx. Vasa deferentia forming "accessory seminal vesicles," i. e., expanded tubes with a thin muscular wall (fig. 24, *c*). These coil along the prostatic vesicle, entering the neck of this separately, one on each side. Prostatic vesicle large, bulbous, free, its anterior part with a thick wall of circular muscle fibers, which thins toward the neck of the prostate; the greater part of the prostate composed of scalloped glandular interior,

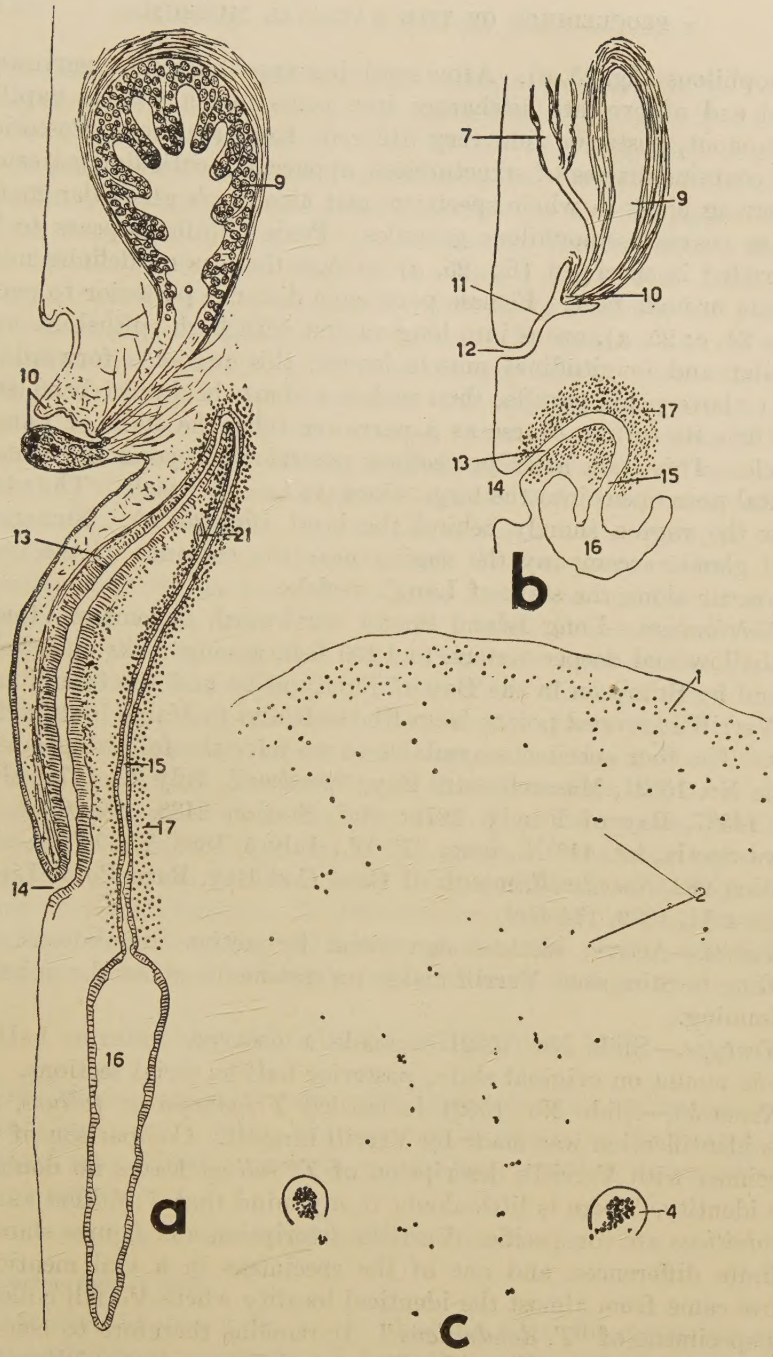

FIGURE 25.—*a*, Copulatory complex of *Discocelides ellipsoides* (Girard), from sections of posterior part of specimen shown in fig. 24, *c*; *b*, copulatory complex of *Latocestus whartoni* (Pearse), from sections of one of Pearse's specimens; *c*, eye arrangement of specimen of *Stylochus ellipticus* (Girard) from Seabrook, Tex., Pearse's specimen No. 385 (this specimen has numerous cerebrofrontal eyes). (See p. 492 for index to numbered parts.)

eosinophilous (fig. 25, *a*). After receiving vasa deferentia, narrowed distal end of prostate discharges into penis lumen. Penis papilla short, stout, posterior side very different from anterior. Posterior wall contains masses of structureless, apparently cuticular material, appearing black in whole specimen, and also much glandular material as coarse eosinophilous granules. Penis papilla appears to be protruded in specimen (fig. 25, *a*) so that there is no definite male antrum or male pore. Female pore some distance posterior to penis (figs. 24, *c*; 25, *a*), opens into long vagina with high epithelium and circular and longitudinal muscle layers; this proceeds forward to point above penis papilla, then makes a sharp backward bend and parallels its former course as a narrower tube, the stalk of Lang's vesicle. This stalk after proceeding posteriorly beyond the female genital pore opens into the large, elongate Lang's vesicle. The uteri enter the vagina shortly behind the bend (fig. 25, *a*). Numerous shell glands accompany the vagina near the entrance of the uteri and occur along the stalk of Lang's vesicle.

Distribution.—Long Island Sound northward, uncommon, found in shallow and deeper waters, to 1,100 feet, among rocks and shells. Found by Stimpson in the Bay of Fundy at 24 and 180 feet; found by Verrill at several points from Rhode Island to Maine in 24 to 270 feet. The four specimens available to me have the following labels: Slide No. 15621, Massachusetts Bay, *Speedwell*, July 26, 1878; slide No. 14337, Bay of Fundy, 1872; vial, Station 2486, *Albatross*, off Nova Scotia, lat. 44° N., long. 57° W., July 5, 1885, 1,140 feet; vial, Station 292, *Speedwell*, mouth of Cape Cod Bay, Race Point Light, August 11, 1879, 174 feet.

Habits.—Active, restless, can swim by active undulations, according to Stimpson; Verrill makes no statements about the animal's swimming.

Neotype.—Slide No. 15621 is made a neotype; anterior half as whole mount on original slide; posterior half as serial sections.

Remarks.—Slide No. 15621 is labeled *Trigonoporus folium*, and this identification was made by Verrill himself. Comparison of this specimen with Verrill's description of *T. folium* leaves no doubt of the identity. There is little doubt in my mind that *T. folium* and *T. dendriticus* are conspecific. Verrill's description and figures show no definite differences, and one of the specimens in a vial mentioned above came from almost the identical locality where Verrill collected his specimens of "*T. dendriticus*." It remains therefore to consider whether *Leptoplana ellipsoides* Girard and *Trigonoporus folium* Verrill are conspecific. As already noted, slide No. 14337 from the Bay of Fundy, hence the locality from which the original specimen of *L.*

ellipsoides came, is labeled *L. ellipsoides*, also identified by Verrill. This specimen is identical with the one labeled *T. folium* but is immature. The only other species from the Bay of Fundy that might be *Leptoplana ellipsoides* is *Notoplana atomata*. Bock, indeed, is of the opinion (1913) that *Leptoplana ellipsoides* is a synonym of *Notoplana atomata*, but he bases this decision on Verrill's figures (1892–93) labeled *Leptoplana ellipsoides*. Now I agree with Bock that these figures of Verrill's are really *Notoplana atomata*, but I think that Verrill's identification is erroneous. *N. atomata* and *L. ellipsoides* cannot possibly be identical, to my mind. First, the most definite character of *L. ellipsoides* in the original description is that the animal is elliptical, with pointed anterior end, whereas *N. atomata* is obovate with broad rounded anterior end. Second, it is stated by Girard that *L. ellipsoides* swims; *N. atomata* never swims. I am therefore confident that *L. ellipsoides* is not a synonym of *N. atomata* but that it is identical with *Trigonoporus folium*. The investigation of the best of the four specimens mentioned above, namely, the whole mount No. 15621, labeled *Trigonoporus folium*, has shown that the animal is not a *Trigonoporus* at all but fits best into the genus *Discocelides*. It differs from the only other known species of the genus, *D. langi*, described by Bock (1913) in that there is no connection between the vagina and the stalk of Lang's vesicle. Bock made the presence of this short duct a generic character, but it seems best to me to omit it from the generic definition in order to include *ellipsoides* in the genus. The present species is certainly closer to *D. langi* than it is to *Plehnia*, the only other genus of the Plehniidae. In *Plehnia* the prostate has a very thick muscular wall occupying the greater part of the organ and a small glandular interior, and Lang's vesicle is short and rounded.

Family LATOCESTIDAE Laidlaw, 1903

Definition.—Craspedommata with slender elongate bodies; tentacles absent; brain and anterior end strewn with numerous small eyes, not grouped into clusters; prostate vesicle free; seminal vesicle absent; penis unarmed.

Genus LATOCESTUS Plehn, 1896

Oculoplana Pearse, 1938.

Definition.—Latocestidae with pharynx near the posterior end, hence with a very long main gut from pharynx to anterior end; copulatory apparatus behind pharynx very close to posterior end; genital pores separate; Lang's vesicle present.

LATOCESTUS WHARTONI (Pearse, 1938), new combination

FIGURE 25, *b*

Oculoplana whartoni PEARSE, 1938, p. 83, fig. 30.

Material.—Twenty-three whole mounts labeled by Pearse *Oculoplana whartoni*, including the type specimen; one of whole mounts made into sagittal serial sections.

Form.—Long and slender, about 8 times as long as wide in life; maximum length in life 36 mm., width 3 mm.; ends rounded; thin, mobile, sides parallel (for figure see Pearse, 1938, fig. 30). Sucker mentioned by Pearse and shown in his figure does not exist; that which Pearse so labels is merely an accidental fold of the margin.

Eyes.—Marginal band along entire margin, two or three rows wide anteriorly, thinning to a single irregular row posteriorly. Numerous small eyes strewn over anterior end, beginning medially behind the brain, extending anteriorly along the main nerve trunks (exaggerated in Pearse's drawing), then spreading fanlike over the anterior end to merge with the marginal eyes.

Color.—Uniform yellowish white.

Digestive tract.—Oval ruffled pharynx near posterior end; long main gut extends forward from this to behind brain giving off on each side numerous side branches; main gut forks behind brain and the forks run forward alongside main nerve trunks giving off branches obliquely forward (Pearse's figure of anterior gut branches erroneous).

Reproductive system.—Vasa deferentia and uteri seen along main gut in posterior third of body. Vasa deferentia have slightly muscular walls as they approach penis, hence do not form well-developed accessory seminal vesicles as in some other *Latocestus* species. Sections of copulatory apparatus poor because of bad histological state of available specimens. Male copulatory apparatus immediately behind pharynx. Prostatic vesicle free, of elongate oval form with thick muscular wall; it leads directly to conical penis papilla at inner end of short, narrow male canal leading to male genital pore (fig. 25, *b*). Vasa deferentia unite to common vas deferens, which joins duct of prostatic vesicle in the penis papilla. Female pore shortly behind male pore, larger than this; vagina runs dorsally, then curves posteriorly, and enters sausage-shaped transverse Lang's vesicle (fig. 25, *b*). Vagina accompanied by numerous cement glands, not muscular. Lang's vesicle variable in different specimens: narrow and transversely elongated in some, shorter and stouter in others; often with folded or irregular wall. Entrance of uteri could not be found.

Distribution.—Florida, North Carolina.

Habits.—On shells in shallow water.

Remarks.—Pearse failed to understand this species, placing it in the wrong section and family of the Polycladida; his genus *Oculoplana* becomes a synonym of *Latocestus*. The species is a typical *Latocestus*, agreeing with other members of the genus in the details of its anatomy. It is the first *Latocestus* to be found on the shores of North America.

Family STYLOCHIDAE Stimpson, 1857 (emend. Bock)

Definition.—Craspedommata with more or less elongate oval to oblong bodies of thick opaque texture; with a pair of nuchal tentacles containing eyes; cerebral and often frontal eyes also present; pharynx richly ruffled; copulatory complex in posterior body fourth; prostatic vesicle free; with true or accessory seminal vesicles.

Genus STYLOCHUS Ehrenberg, 1831

Imogine Girard, 1853.
Eustylochus Verrill, 1892.

Definition.—Stylochidae with well-developed retractile tentacles; genital pores close together; true seminal vesicle, often tripartite; prostatic vesicle large; vagina simple, short; no Lang's vesicle.

STYLOCHUS ELLIPTICUS (Girard, 1850)

Figure 25, *c*

Planocera elliptica Girard, 1850, p. 251.
Planocera nebulosa Girard, 1853, p. 367.
Stylochopsis littoralis Verrill, 1873, p. 632, pl. 19, fig. 99.
Stylochus littoralis Lang, 1884, p. 453.—Meixner, 1907, p. 428, pl. 27, fig. 8.
Eustylochus ellipticus Verrill, 1892, p. 467, pl. 40, fig. 2; pl. 41, figs. 1, 1a; pl. 42, figs. 1, 1a.—Pearse, 1938, p. 73.
Eustylochus meridionalis Pearse, 1938, p. 73, fig. 25.
Stylochus ellipticus Hyman, 1939a, p. 130, figs. 2, 3.

Material.—Many slides of Pearse labeled *Eustylochus meridionalis*, some labeled *Eustylochus ellipticus*, several unidentified vials in U. S. National Museum collection.

Form.—Oval, more or less elongate, flat, thick, with thinner margins, maximum length 20–25 mm., with a pair of tentacles at the level of the brain, elongate and pointed in life, often retracted to a rounded shape in preserved specimens. For general appearance see Hyman, 1939a, fig. 2, p. 133, and Pearse, 1938, fig. 25.

Eyes.—Marginal band of eyes limited to anterior third or half of the body; in some specimens scattered eyes smaller than those along the anterior margin may occur along rest of body margin. Tentacles filled with eyes; cerebral and frontal eyes not distinctly separable,

very variable. Typical arrangement, shown in my figure referred to above, is pair of groups of two to several eyes each between the tentacles, and another pair of two to several eyes each anterior to these; may also be a few eyes behind these four groups, over the brain ganglia. Some specimens in the Pearse collection, collected in Florida and at Seabrook, Tex., have a large number of cerebrofrontal eyes, beginning behind the tentacles, extending forward between the tentacles and then spreading fanlike toward the anterior margin, where they merge with the marginal band (fig. 25, *c*).

Color.—Very variable, cream, yellow, reddish brown, brown, olive, or gray, veined or reticulated with a lighter color, or finely maculated with a darker color on a lighter ground; with a middorsal light stripe, usually more noticeable toward the posterior end.

Digestive tract.—Pharynx about central, relatively small, moderately ruffled; digestive branches anastomosed into a reticulum in the periphery of the body (hence incorrectly shown by Pearse).

Reproductive system.—Described and figured by Hyman, 1939a, fig. 3, p. 133. Typical of the genus but differs from other species in that the copulatory complex is very close to the posterior margin.

Distribution.—Texas to Prince Edward Island, very common south of Massachusetts.

Habits.—Littoral, among barnacles, oysters, and shells, on pilings, under rocks; feeds on oysters and barnacles.

Remarks.—Pearse's attempt to revive the genus *Eustylochus* cannot stand, since this genus was based on "*Planocera*" *elliptica*, and I have shown that this species is a typical *Stylochus* (Hyman, 1939a). In that paper I overlooked the fact that Meixner, in 1907, investigated the same species and found it to be a *Stylochus*. There cannot be any doubt that the present species is Girard's *Planocera elliptica*, since his figures of this (1893) could not pertain to any other polyclad. In 1853, Girard, collecting off the Carolina coast, named gray specimens "*Planocera*" *nebulosa*, but obviously these are merely a color variation of *Stylochus ellipticus*. Pearse (1938) repeated the attempt to separate southern specimens as a new species, "*Eustylochus*" *meridionalis*, on the basis of color and arrangement of the cerebrofrontal eyes. If this were a valid species, its name would obviously be *nebulosa* Girard; but the points cited by Pearse are already covered in Verrill's account of the variations of *S. ellipticus*. My examination of Pearse's specimens labeled *Eustylochus meridionalis*, including serial sections made from some of them, has failed to show any grounds whatever for separating them from *S. ellipticus*. I have also sectioned the copulatory apparatus of one of the Seabrook, Tex., specimens mentioned above as having a large number of cerebrofrontal eyes, as in fig. 25, *c*, and found it to be identical with that of speci-

mens having a typical eye arrangement. I therefore refer all Pearse's specimens to *S. ellipticus*. A whole mount, U. S. F. C. No. 14398, collected under a wharf at Woods Hole, Mass., September 19, 1882, and labeled by Verrill *Planocera nebulosa* is *Stylochus ellipticus*.

STYLOCHUS FRONTALIS Verrill, 1892

Stylochus frontalis Verrill, 1892, p. 465, pl. 44, fig. 1.
Stylochus inimicus Palombi, 1931, p. 218, figs. 1–4; pl. 4, figs. 1–4—Pearse, 1938, p. 69, fig. 23.—Pearse and Wharton, 1938, figs. 1–21.
Stylochus tenax Palombi, 1936, p. 4, figs. 1–7; pl. 1, figs. 1, 2.

Material.—Many whole mounts collected by Pearse.

Form.—Oval, flat, of firm consistency, up to 50 mm. long by 27 mm. wide; tentacles conical, slightly tapering, very retractile (Pearse, 1938, fig. 23).

Eyes.—Numerous eyes in, some around, tentacles; cerebrofrontal eyes begin behind tentacles as paired elongate groups coming to a point posteriorly; anterior to tentacles these merge and spread in fan shape to join marginal band. Marginal band completely encircles margin, but is wider and of larger eyes anteriorly, diminishing posteriorly.

Color.—Gray or yellowish gray, lighter toward margins; Verrill reports some mottling with brown in a single specimen he had; Pearse and Wharton indicate a median light line.

Digestive tract.—Pharynx central, large, elongate, richly ruffled, with about five or six main branches on each side; mouth central; intestine richly branched, not anastomosed.

Reproductive system.—Figured and described by Palombi, 1931, 1936.

Distribution.—Florida to Texas, oyster beds; probably also northward to the Carolinas.

Habits.—Found among living and dead oyster shells; feeds chiefly on oysters; biology described by Pearse and Wharton, 1938.

Remarks.—Verrill found a single specimen, 25 by 12 mm., on the bottom of a ship that had come from the Carolina coast (see further under *Stylochoplana angusta*). There are only two stylochids common in that region—*S. ellipticus* and *S. inimicus*. Verrill's figure of the eyes clearly indicates *S. inimicus*, and his description also agrees satisfactorily with this species. I am therefore of the opinion that *S. inimicus* and *S. frontalis* are identical. Palombi assigned Florida stylochids preying on oysters to two species, *S. inimicus* and *S. tenax*. Pearse is of the opinion that these are conspecific. The U. S. National Museum has lent Palombi's paratypes of *S. tenax* for examination, and I have sectioned the copulatory apparatus of one of them. The paratypes are certainly very much thicker than any specimens of *S.*

inimicus available to me, but I cannot consider this character of any importance in view of the varying degrees of contraction produced in specimens of Turbellaria on fixation. I found no differences in eye arrangement and copulatory apparatus between the two forms. According to Palombi's figures and text, the genital pores are farther apart in *inimicus* than in *tenax*, but many of the whole mounts of *inimicus* kindly presented to me by Dr. Pearse show them as close together as in *tenax*. For *tenax* Palombi figures and describes numerous closely packed cement glands entering the middle third of the vagina and neither mentions nor illustrates any cement glands for *inimicus;* but my sections of *inimicus* have cement glands identical in location and arrangement with those of *tenax*. In short, I am of the same opinion as Pearse, that *inimicus* and *tenax* are identical.

STYLOCHUS ZEBRA (Verrill, 1882)

Stylochopsis zebra VERRILL, 1882, p. 462.
Stylochus zebra VERRILL, 1892, p. 463, pl. 40, fig. 3; pl. 42, figs. 2, 2a.—PEARSE, 1938, p. 72.—PEARSE and LITTLER, 1938, pl. 20, fig. 3.—HYMAN, 1939a, p. 133, fig. 1.

Material.—Number of whole mounts collected by Pearse.

Form.—Oblong or oblong-elliptical, thick, firm, rounded at ends, maximum length 30–40 mm., breadth 10–12 mm.; tentacles short, rounded.

Eyes.—Marginal band completely encircles margin, almost as wide posteriorly as anteriorly but with fewer and less crowded eyes. Tentacles contain numerous eyes; cerebral eyes in paired elongated clusters which merge into frontal eyes scattered over anterior end and merging into marginal band.

Color.—Dorsal pattern of alternating flesh and brown cross bars of which the most anterior and posterior ones are V-shaped.

Digestive tract.—Pharynx large, central, with elongate branching folds; mouth anterior.

Reproductive system.—Described and figured by Hyman, 1939a, fig. 1, p. 133; prostatic vesicle rounded, erect, penis papilla well developed, conical; seminal vesicle tripartite.

Distribution.—Massachusetts to North Carolina.

Habits.—Sluggish, inactive, found on wharves and pilings and oftenest in shells, especially those containing hermit crabs.

STYLOCHUS PULCHER, new species

FIGURE 26

Material.—One living specimen sent by Dr. Pearse.

Form.—Elongate, oblong, anterior end somewhat truncate, posterior end pointed (fig. 26, *a*), 30 mm. long, 8 mm. wide when extended in motion; tentacles rounded.

Eyes.—Numerous eyes in each tentacle; cerebral clusters large, broad; scattered frontal eyes; marginal band of numerous small eyes on anterior end becomes indistinct; marginal band of few scattered eyes in posterior half.

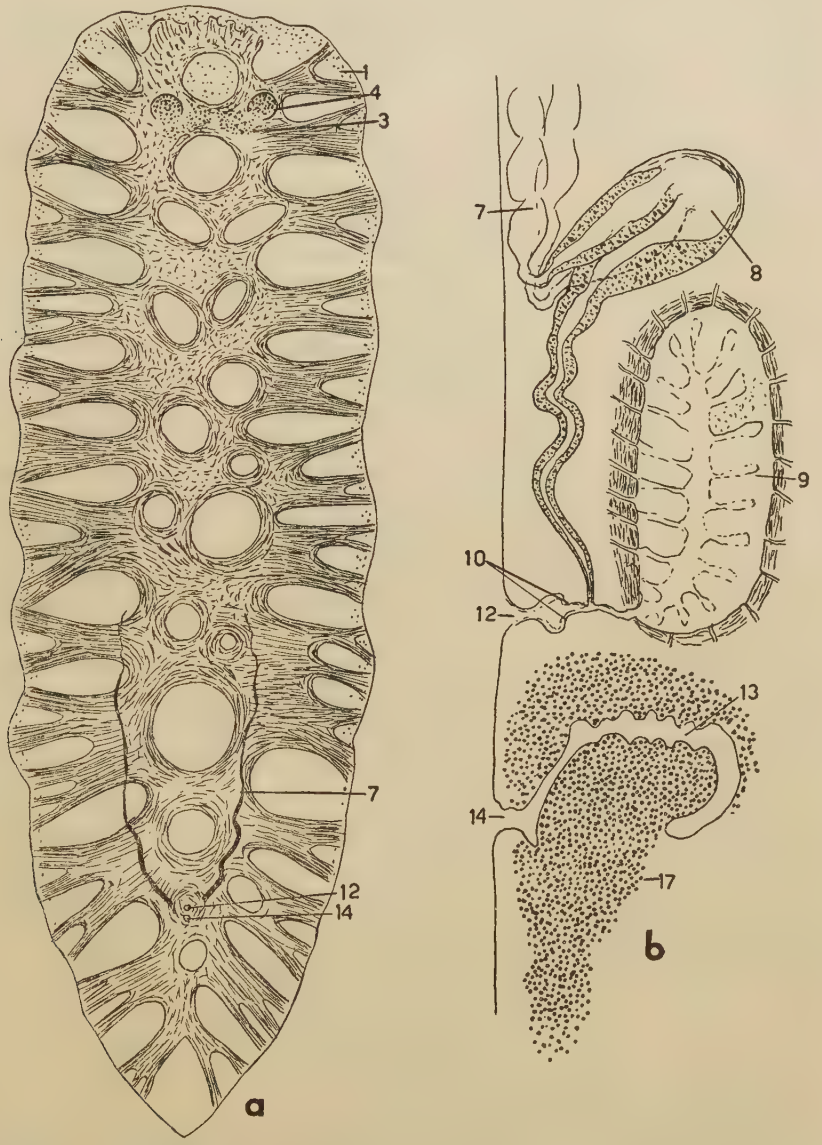

FIGURE 26.—*a*, *Stylochus pulcher*, new species, drawn from life; *b*, copulatory complex of *S. pulcher*, from sections made of sexual region of specimen shown in fig. 26, *a*. (See p. 492 for index to numbered parts.)

Color.—Dorsal surface with striking color pattern of brown on a flesh ground, similar to pattern of *S. zebra;* wide brown middorsal area interrupted by spots of ground flesh color; from this brown rays extend in groups to margin (fig. 26, *a*).

Digestive system.—Could not be seen because of pigment.

Reproductive system.—Sexual region removed and sectioned sagittally. Copulatory apparatus (fig. 26, *b*) typical of the genus *Stylochus.* Vasa deferentia seen in living animal proceeding backward from about middle of body. As they approach the copulatory apparatus they acquire a thick muscular wall and hence are accessory seminal vesicles. Copulatory apparatus in last fifth of body, about 6 mm. from posterior end. True seminal vesicle bulbous, somewhat erect; accessory seminal vesicles course along its anterior end before entering, producing tripartite seminal vesicle common in many species of *Stylochus.* From seminal vesicle muscular sinuous duct proceeds backward to enter duct of prostate vesicle. Prostatic vesicle large, oval, horizontal, with moderately thick muscular coat, and chambered interior; wall penetrated by ducts of extracapsular prostatic glands. Duct of prostatic vesicle runs directly ventrally, receives seminal vesicle; beyond this junction, canal becomes lumen of very slightly developed penis papilla; pyriform male atrium leads to male genital pore. Female genital pore shortly behind male one; vagina simple curved tube; proceeds dorsally, then curves backward to receive uteri; numerous cement glands along its course; vagina but slightly muscular.

Differential diagnosis.—*Stylochus pulcher* differs from other members of the genus in the color pattern, poor development of marginal band of eyes in the posterior half, and extremely small penis papilla.

Distribution.—Collected at Beaufort, N. C., dredged in 60 feet, in a snail shell occupied by a hermit crab.

Type.—Whole mount; copulatory apparatus as serial sections; U.S.N.M. No. 20531.

Remarks.—The possibility that this species might be merely a color variation of *S. zebra* was dispelled by study of the copulatory apparatus, which is obviously different from that of the latter.

STYLOCHUS OCULIFERUS (Girard, 1853)

FIGURES 27, 28, *a*

Imogine oculifera GIRARD, 1853, p. 367.
Stylochus oculiferus DIESING, 1861, p. 570.
Stylochus floridanus PEARSE, 1938, p. 71, fig. 24.

Material.—Five whole mounts in Pearse collection, including type of *Stylochus floridanus;* sexual region of three removed and sectioned.

Form.—Very large, oval with ruffled margins, maximum length 53 mm., width 27 mm. (fig. 27); tentacles conical, tapering to a point, but rounded and contracted in preserved specimens.

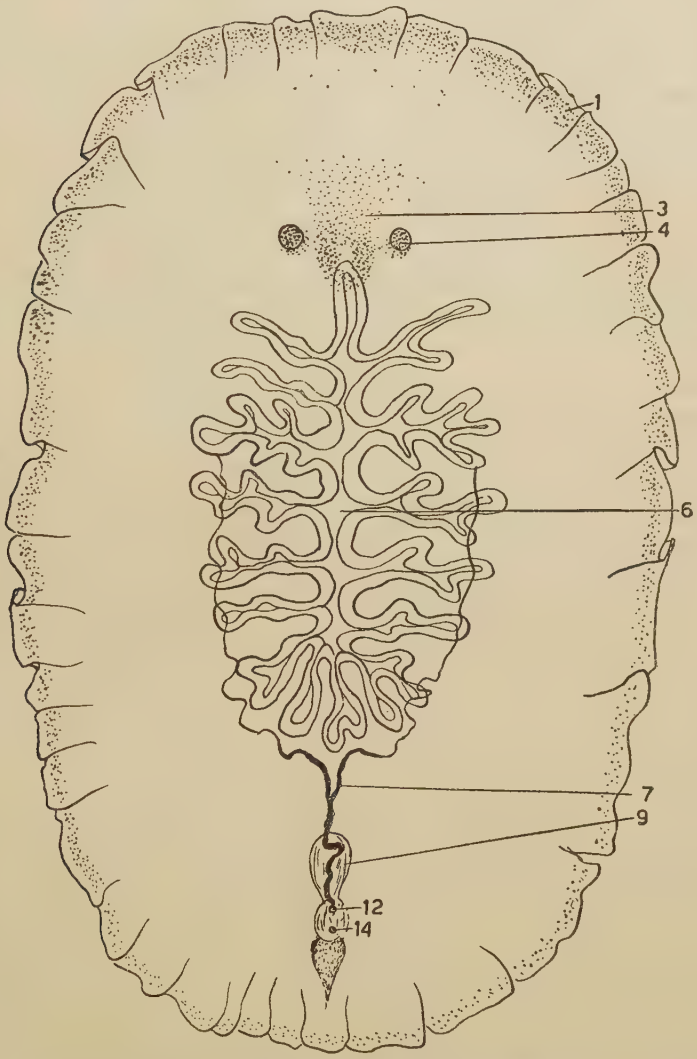

FIGURE 27.—*Stylochus oculiferus* (Girard): U. S. N. M. No. 20190. (See p. 492 for index to numbered parts.)

Eyes.—Marginal band well developed along the entire margin but broader and with more crowded eyes anteriorly; tentacles filled with eyes, eyes also around their bases; cerebral eyes begin behind level of tentacles as more or less paired, somewhat dense, elongated groups continuing laterally toward the tentacles as scattered eyes

and forward as diverging scattered eyes to a level about as far anterior to the tentacles as behind them; cerebral eyes therefore not merging into marginal eyes but separated from them by a considerable space practically free from eyes (fig. 27).

Color.—Cream to brown covered with small red or pink spots.

Digestive tract.—Pharynx central, large, with large complex lateral folds; mouth below anterior part of pharynx; intestine much branched to periphery, not anastomosed.

Reproductive system.—Sexual apparatus removed from the two largest specimens and sectioned but proved to be very immature despite presence of genital pores; it then became necessary to remove the sexual region of the "type" specimen for sectioning; this was mature but imperfect in the region of the penis papilla. Copulatory apparatus typical of the genus *Stylochus* (fig. 28, *a*). Ends of vasa deferentia with thick muscular walls forming accessory seminal vesicles; these open into true seminal vesicle, forming tripartite organ; muscular wall chiefly of circular muscles. Seminal vesicle tapers into sinuous duct, which joins duct of prostatic vesicle. Prostatic vesicle of moderate size, pyriform, with moderately thick wall of longitudinal fibers pierced by ducts of prostatic glands; interior chambered. Prostatic duct joins duct from seminal vesicle at base of penis papilla. Penis papilla imperfect in available sections but appears to be of elongate conical form (fig. 28, *a*). Female pore short distance behind male pore, leads into simple vagina only slightly muscular. Vagina extends vertically, then curves downward terminating by receiving the uteri. Numerous shell glands enter the middle third of the vagina.

Distribution.—Florida, North Carolina, rather rare.

Habits.—Found mostly on oyster beds.

Neotype.—Pearse's type specimen of "*Stylochus floridanus*," U.S.N.M. No. 20187, becomes the neotype of *Imogine oculifera* Girard; sexual region of this specimen as serial sections, three slides.

Remarks.—Comparison of the original description of *Imogine oculifera* with Pearse's description of "*Stylochus floridanus*" leaves no doubt of the identity of the two species. Pearse gave no grounds for placing the species in the genus *Stylochus*. As the genera of the Stylochidae cannot be determined without serial sections of the copulatory apparatus, it was necessary to have sections of a mature worm. After sections of the sexual region of two specimens showed them to be immature, it was unavoidable to remove and section the sexual part of the type specimen. These sections showed that the animal is a *Stylochus*, and hence Girard's genus *Imogine* becomes a synonym of *Stylochus*.

Section SCHEMATOMMATA Bock, 1913

Definition.—Acotylea without marginal eyes; eyes in cerebral and tentacular clusters, well back from the anterior margin.

Family LEPTOPLANIDAE Lang, 1884 (emend. Bock)

Definition.—Schematommata with flat, moderately elongate bodies, often expanded anteriorly; tentacles present or absent; prostatic vesicle when present always interpolated [6]; usually brown above, seldom white; uteri confluent anterior to the pharynx.

Genus STYLOCHOPLANA Stimpson, 1857

Definition.—Leptoplanidae with distinct seminal vesicle and prostatic vesicle; the ejaculatory duct from the seminal vesicle does not penetrate into the prostatic vesicle.

STYLOCHOPLANA ANGUSTA (Verrill, 1893)

Leptoplana angusta VERRILL, 1893, p. 485, pl. 40, fig. 8; pl. 44, figs. 2, 3 (not *Stylochoplana angusta* Palombi, 1928, or *Leptoplana angusta* Pearse, 1938, or *Leptoplana angusta* Pearse and Littler, 1938).
Stylochoplana angusta HYMAN, 1939a, p. 139, figs. 10, 11.

Remarks.—I have already described this species, but one point was left unsettled—whether there are two exits to the genital atrium. Fortunately four more of the specimens collected by Verrill were found in U. S. National Museum material, and there is also a small specimen mounted whole in Pearse's Florida material. Two of the Verrill specimens and the Florida specimen were sectioned; the latter showed but one genital pore; of the Verrill specimens, one was in poor shape but the other clearly has two genital pores, one in the usual ventral position, the other opening posteriorly into the notch. It seems probable that only the riper specimens have the second opening. This peculiarity together with the far anterior position of Lang's vesicle would justify the creation of a new genus for this species. I forbear to do so, since Palombi, who has made a special study of the genus *Stylochoplana*, informs me in a letter that he proposes to create such a genus. The extra genital pore of the species appears to represent a very short ductus vaginalis, a structure not uncommon in the family Leptoplanidae (see below, p. 475).

Pearse and associates confused three different species under the name *Leptoplana angusta* and Pearse and Walker list *angusta* among New England polyclads. It is not, however, a New England form, since Verrill found his specimens on the bottom of a whaling vessel

[6] The prostate is said to be interpolated when it forms part of the male canal so that the sperm passes through its lumen.

that had come from the Carolinas. Now that a specimen from Florida (Port St. Joe, collected March 11, 1936) has turned up in the Pearse material, it may be asserted with certainty that the species is a native of the southern part of our Atlantic coast. Previous to this finding I was inclined to believe that the vessel had acquired the worms elsewhere. The probability that the other polyclad found by Verrill on the same vessel, namely, *Stylochus frontalis*, is also native to the same region, induced me to examine Verrill's figure and description of this form more closely, and I then recognized it as the polyclad known as *Stylochus inimicus* (see p. 461).

Genus NOTOPLANA Laidlaw, 1903

Leptoplana (in part).

Definition.—Leptoplanidae with distinct seminal vesicle and chambered prostatic vesicle; the duct from the seminal vesicle projects into the interior of the prostatic vesicle; tentacles usually absent.

NOTOPLANA ATOMATA (O. F. Müller, 1776)

Planaria atomata O. F. Müller, 1776, p. 223.
Leptoplana atomata Ørsted, 1843, p. 569.
Leptoplana dröwbachensis Ørsted, 1845, p. 415.
?*Polycelis variabilis* Girard, 1850, p. 251.
Leptoplana variabilis Diesing, 1861, p. 542.—Verrill, 1892, p. 480, pl. 41, fig. 7; pl. 43, figs. 2, 3.
Leptoplana virilis Verrill, 1892, p. 478.—Pearse and Walker, 1939, p. 17, fig. 8.
Leptoplana ellipsoides Verrill, 1893, p. 483, pl. 40, figs. 5, 6; pl. 43, fig. 4 (not *L. ellipsoides* Girard, 1854).
Notoplana atomata Bock, 1913, p. 195.—Hyman, 1939a, p. 135, figs. 4, 5.
Leptoplana angusta Pearse, 1938, p. 76, fig. 26 (not *L. angusta* Verrill, 1893).

Material.—Many whole mounts in Pearse collection, some labeled *Notoplana atomata*, others *Leptoplana angusta*, and *Leptoplana virilis;* several unidentified vials in collection of U. S. National Museum; six whole mounts found in Peabody Museum, two labeled *Leptoplana variabilis* by Verrill.

Form.—Typically leptoplanid, elongated obovate or oblanceolate (see Hyman, 1939a, fig. 4, p. 137), broadest through the level of the brain, thence tapering to the rounded or obtuse posterior end; tentacles absent; maximum length 28 mm.

Eyes.—In four conspicuous, well-separated clusters, two tentacular and two cerebral; tentacular clusters rounded of 6–15 large eyes and a few smaller ones; cerebral clusters more elongated, of 15–60 eyes of various sizes, but smaller than the largest of the tentacular eyes. Number of eyes increases with age.

Color.—Various shades of brown, more or less flecked and streaky.

Digestive tract.—Pharynx central, elongated, well ruffled, mouth anterior to center of pharynx, intestinal branches radiating, anasto-

mosed to a network with rounded meshes, in which the ova are often conspicuous.

Reproductive system.—Fully described and illustrated by Bock, 1913, and Hyman, 1939a. Diagnostic features are the spherical prostate, elongated penis pocket containing the arched penis stylet, and the long, slender Lang's vesicle.

Distribution.—Massachusetts northward to Scandinavia, common.

Habits.—Sluggish, littoral, under stones and on seaweeds, in tide pools, on pilings, also sublittoral to 300 feet.

Remarks.—This is the commonest polyclad of the north Atlantic coast of North America. Although it seems to me easily recognized, it has been regularly misidentified. Mature individuals are easily identified by the curved penis stylet, seen by putting a little pressure on the animal. Verrill called this species by three different names, *Leptoplana variabilis*, *L. virilis*, and *L. ellipsoides*. Whether it actually is Girard's *Polycelis variabilis* is difficult to decide, because of the nature of the original description. Since Verrill's time, the species has been commonly called *Leptoplana variabilis* by American zoologists. Previously I had some little doubt that Verrill's figures of *Leptoplana variabilis* could be certainly identified as *N. atomata*, since they differ in some details; but these are probably inaccuracies, and the finding of two specimens labeled *L. variabilis* by Verrill himself confirms the identity. I am also decidedly of the opinion that Verrill's species *L. virilis* is likewise *N. atomata*. I have already expressed my opinion that what Verrill mistakenly called *L. ellipsoides* are specimens of *N. atomata*.

Pearse and associates frequently failed to recognize *N. atomata*. In the collections of the U. S. National Museum there exists a whole mount No. 134562 collected in Baffin Bay by Capt. Robert A. Bartlett, August 3, 1935, which had been identified by Pearse as *Leptoplana folium*. This specimen is figured in Pearse, 1938, fig. 26, where it is called *Leptoplana angusta*. In Pearse and Walker, the same whole mount is said to be *Leptoplana virilis*. I have examined this whole mount and find it to be *Notoplana atomata*. The following three whole mounts in the possession of the U. S. National Museum, which were identified by Pearse as *Leptoplana angusta*, are also *N. atomata:* U. S. F. C. No. 15620, Nantucket, Mass., September 8, 1875, 81 feet; U. S. F. C. No. 15622 (two slides), Bay of Fundy, off Cherry Island, 1872, 120–150 feet, originally labeled *Leptoplana ellipsoides*. *Notoplana atomata* is thus one of the three leptoplanid species confused by Pearse and his associates under the name of *Leptoplana angusta*.

In addition there were in the material sent by the U. S. National Museum a number of unidentified vials all of which are *Notoplana*

atomata. These came from various points off the coast of Massachusetts and from Casco Bay, Maine.

Genus EUPLANA Girard, 1893

Discoplana Bock, 1913.
Conjuguterus Pearse, 1938.

Definition.—Leptoplanidae without definite prostatic vesicle; tentacles absent; body usually elongated, more or less slender.

EUPLANA GRACILIS (Girard, 1850)

Prosthiostomum gracile Girard, 1850, p. 251.—Verrill, 1893, p. 496, fig. 1.—Pearse and Walker, 1939, p. 19, fig. 15.
Euplana gracilis Girard, 1893, p. 198, pl. 6, fig. 62.—Pearse and Littler, 1938, p. 238, pl. 20, fig. 6.—Pearse and Walker, 1939, p. 18, fig. 13.—Hyman, 1939a, p. 137, figs. 6–8.
Conjuguterus parvus Pearse, 1938, p. 81, fig. 29.

Material.—Many whole mounts labeled by Pearse *Conjuguterus parvus*, including type.

Form.—Small, slender, elongate, anterior end rounded to obtuse, maximum length, 8–10 mm., without tentacles (for figure see Hyman, 1939a, fig. 6, p. 137).

Eyes.—Remarkably few, usually six on each side; tentacular groups consist of two eyes each, cerebral groups of four eyes on each side in an irregular lengthwise row.

Color.—Yellowish or brownish gray, somewhat speckled.

Digestive tract.—Pharynx small, only slightly ruffled, anterior to middle; main intestinal trunk conspicuous behind pharynx; from this lateral branches extend to periphery, not anastomosed.

Reproductive system.—Described and figured by Hyman, 1939a, fig. 8, p. 137. Description of Pearse (1938, p. 81) erroneous; no prostatic vesicle, no penis papilla, no Lang's vesicle.

Distribution.—Florida to Prince Edward Island, common.

Habits.—Active, among seaweeds, hydroids, tunicates, etc., on pilings, also among old shells, littoral.

Remarks.—This species was wrongly placed by Pearse and considered a type of a new genus, *Conjuguterus*, which is a synonym of *Euplana*. In Pearse and Littler and Pearse and Walker the name was changed to *Euplana gracilis* (in consequence of information received from me in letters), but it was nowhere indicated that this was the same species previously called *Conjuguterus parvus* nor was the erroneous familial placing corrected. In Pearse and Walker *Euplana gracilis* and *Prosthiostomum gracile* are presented as distinct species and each is figured; the figure of the latter appears to have been constructed by slightly altering *Prosthiostomum lobatum*, a genuine species of *Prosthiostomum*. As I already pointed out

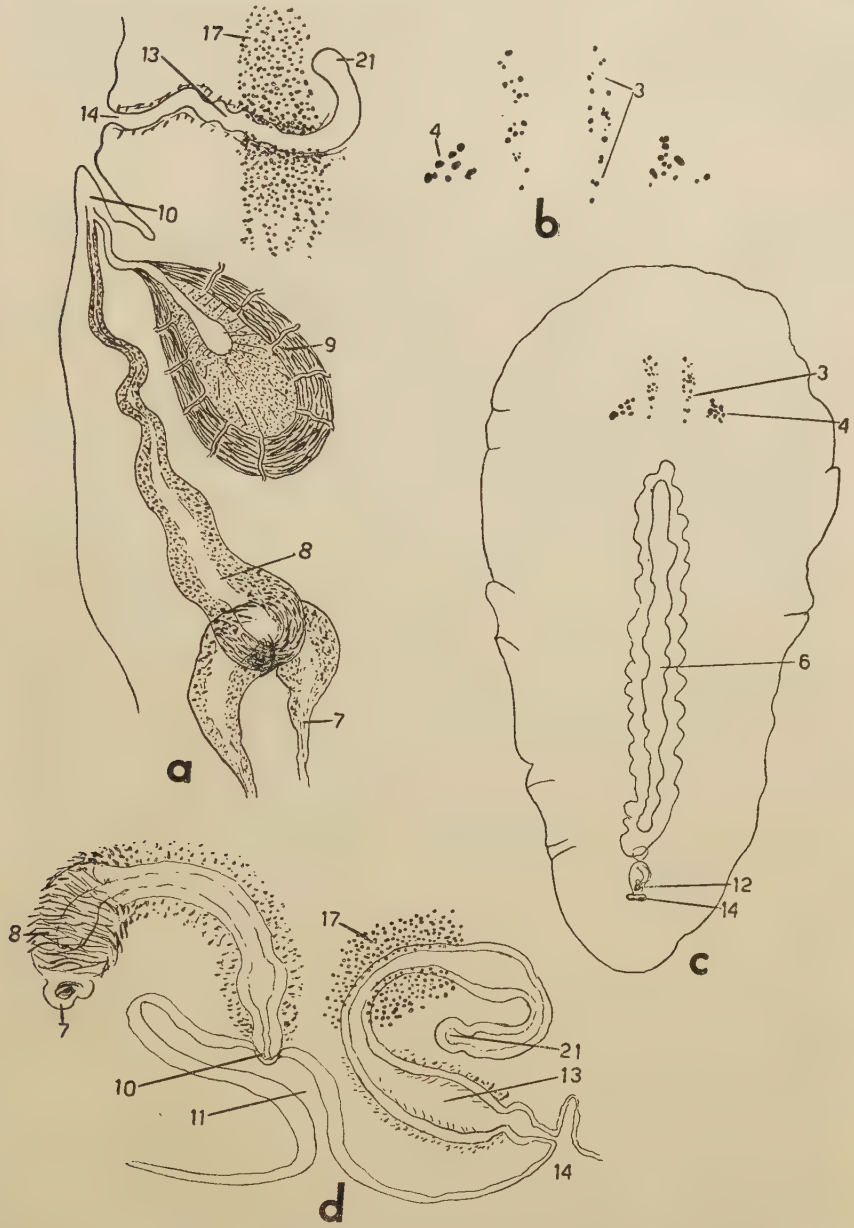

FIGURE 28.—*a*, Copulatory apparatus of *Stylochus oculiferus* (Girard), from sections of sexual region of specimen shown in fig. 27; *b*, eyes of *Euplana carolinensis*, new species; *c*, *E. carolinensis*, from Pearse's whole mount No. 370, type; *d*, copulatory complex of *E. carolinensis*, from sections made of rear part of specimen shown in fig. 28, *c*. (See p. 492 for index to numbered parts.)

(Hyman, 1939a), *P. gracile* is not a *Prosthiostomum* at all and this was realized by Girard himself in 1893 when he created a new genus for the species.

EUPLANA CAROLINENSIS, new species

FIGURE 28, *b–d*

Leptoplana angusta PEARSE and LITTLER, 1938, p. 237.

Material.—One whole mount in Pearse collection labeled *Leptoplana angusta*, slide No. 370.

Form.—Elongate obovate, anteriorly expanded, widest at level of brain, tapering from there to blunt posterior end, 5 mm. long (somewhat contracted); no tentacles (fig. 28, *c*).

Eyes.—In four separated clusters; tentacular clusters rounded, of 8–12 eyes; cerebral clusters elongated, of 20–25 eyes (fig. 28, *b*).

Color.—Unknown, presumably brownish above.

Digestive tract.—Pharynx long and narrow (fig. 28, *e*), with slight folds; digestive branches not well seen.

Reproductive system.—Copulatory apparatus directly behind the pharynx (fig. 28, *c*); genital pores separate, but only a short distance apart. Sections of copulatory apparatus poor, but apparatus corresponds to the genus *Euplana* without much doubt; probably distorted by flattening of specimen to make a whole mount. Male genital pore leads into elongated male atrium (fig. 28, *d*), probably distorted. Vasa deferentia enter from below bulbous seminal vesicle with thick wall of circular fibers. From this muscular male canal proceeds posteriorly and terminates in small penis papilla projecting into roof of male atrium. There appeared to be no definite differentiation of a prostatic vesicle, nor could any prostatic glands be seen, because of the poor histological state of the specimen. Female genital pore opens into a sort of pocket, probably artificial; vagina with thin muscular coat proceeds anteriorly, then dorsally, and finally makes a U-shaped curve, receiving the uteri at the end of this curve (fig. 28, *d*); Lang's vesicle absent. Cement glands enter that part of the vagina preceding the U-bend.

Differential diagnosis.—Combination of elongate pharynx, separated cerebral and tentacular eye clusters, long male atrium, small penis papilla, enlarged seminal vesicle, and curved vagina.

Distribution.—Beaufort, N. C., Bogue Sound, on shells, ascidians, collected by Pearse, September 9, 1937.

Type.—Anterior half as whole mount, posterior half as sagittal sections (1 slide), U. S. N. M. No. 20532.

Remarks.—This is the second leptoplanid confused by Pearse under the name *Leptoplana angusta*. It is the specimen mentioned

in Pearse and Littler (p. 237) under this name as collected in Bogue Sound. The specimen mentioned in Pearse (1938, p. 77) as collected at Beaufort in 1938 could not be found in the Pearse material.

DIGYNOPORA, new genus

Definition.—Leptoplanidae with a ductus vaginalis opening to the exterior by a separate pore behind the common genital pore; male system as in *Stylochoplana;* tentacles wanting.

Type.—*D. americana*, new species.

DIGYNOPORA AMERICANA, new species

FIGURE 29, *a–c*

Leptoplana angusta PEARSE and LITTLER, 1938, pl. 20, fig. 4.

Material.—One whole mount in Pearse collection, No. 446.

Form.—Elongate, slender, ends rounded, sides probably parallel, length 13.5 mm., width 5 mm., contracted, much longer and slenderer in life (26 mm. according to Pearse); tentacles wanting (fig. 29, *b*). (The description of Pearse and Littler of this specimen is merely a copy of Verrill's description of *Leptoplana angusta.*)

Eyes.—Tentacular and cerebral clusters blended on each side into an elongated group of about 40–50 eyes (fig. 29, *a*) in which the tentacular groups containing the larger eyes can be somewhat distinguished.

Color.—Statement of Pearse and Littler about the color is a copy of Verrill's statement but very likely the animal is brown above.

Digestive system.—Pharynx elongated, narrow, with moderate lateral folds, slightly anterior to center of body (fig. 29, *b*); digestive branches radiating, anastomosed.

Reproductive system.—Sexual region removed and sectioned; found in very bad histological condition, especially the female tract. Common genital pore well removed from posterior end, about 3 mm. from this (fig. 29, *b*). Male apparatus as in the genus *Stylochoplana.* Male antrum occupied by large penis papilla of elongated conical form, not very muscular (fig. 29, *c*). Vasa deferentia proceed along rear part of pharynx as sinuous tubes, enter ventral end of oval seminal vesicle with thick muscular wall of circular fibers. Narrowed duct also with muscular wall of circular fibers proceeds posteriorly, enters oval prostatic vesicle, larger than seminal vesicle, with very thick muscular wall of chiefly circular fibers, penetrated by ducts of gland cells; relatively small lumen of prostate lined by glandular epithelium. Prostate passes directly into penis papilla. Female tract unfortunately could not be clearly made out on the sections, but the presence of a ductus vaginalis is definite. Vagina opens by small

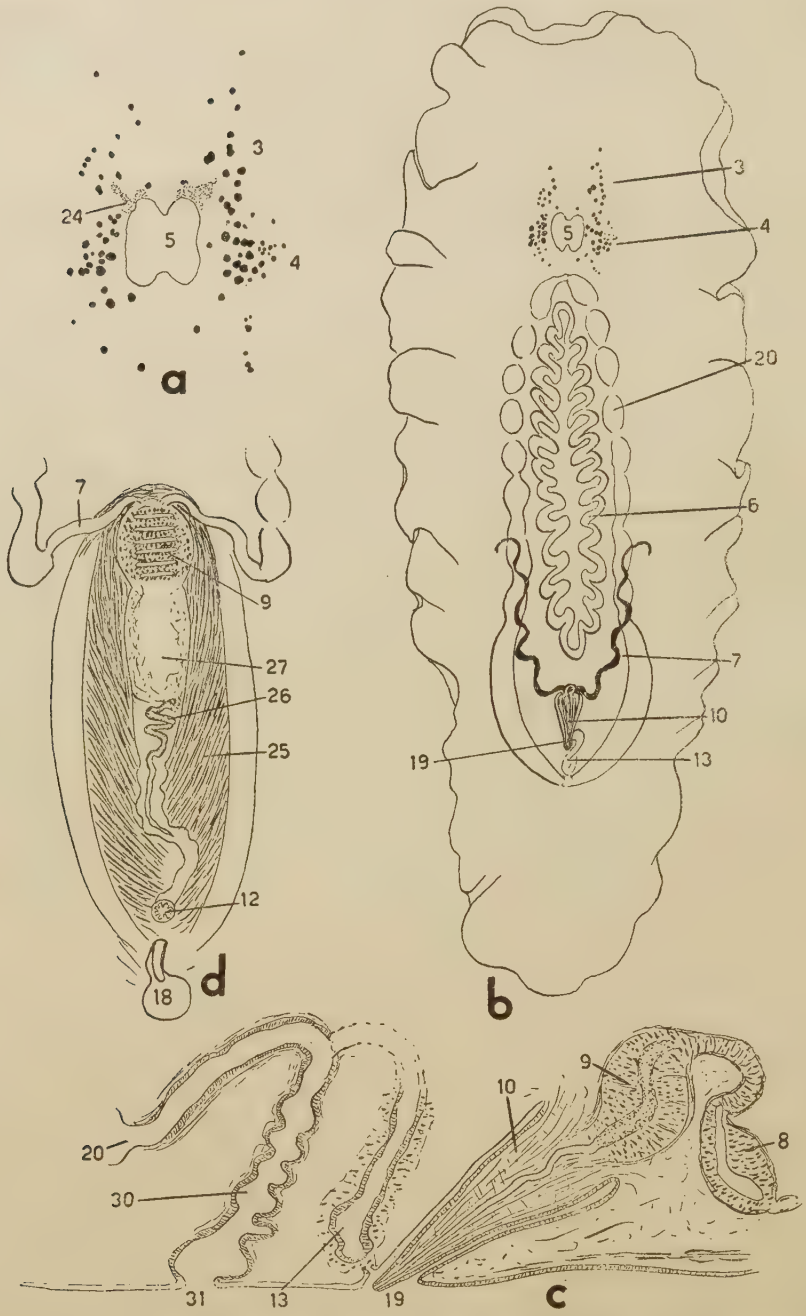

FIGURE 29.—*a*, Eyes of *Digynopora americana*, new genus and species, same specimen as fig. 29, *b*; *b*, *D. americana*, from Pearse's whole mount No. 446, type; *c*, copulatory organs of *D. americana*, from sections made of sexual region of specimen shown in fig. 29, *b*; *d*, Dorsal view of copulatory complex of *Planctoplanella atlantica*, new genus and species. (See p. 492 for index to numbered parts.)

aperture into rear wall of genital atrium but the actual connection, although I do not doubt its existence, could not be seen on the sections. Vagina then proceeds dorsally and appears to make a downward bend as a ductus vaginalis opening ventrally by a large pore behind the common genital pore (fig. 29, *c*); but as indicated in the figure the continuity could not be entirely traced. Vagina and ductus vaginalis with moderately muscular walls of inner circular and outer longitudinal fibers. From dorsal end of ductus vaginalis duct proceeds posteriorly and appears to receive the much-swollen uteri; hence this duct is seemingly the connection of the uteri with the vagina. Its continuity with the ductus vaginalis was perfectly clear on the sections; but as already noted the continuity of both with the vagina could not be established. The complete elucidation of this very interesting species must await the finding of further material.

Distribution.—St. Josephs Bay, Fla., five individuals taken by Pearse in March 1936 (whereabouts of the other four specimens could not be ascertained).

Habits.—Among ascidians on pilings.

Type.— One whole mount; sexual region as serial sections (2 slides), U. S. N. M. No. 20533.

Remarks.—This is the third species that Pearse called *Leptoplana angusta.* It is the specimen mentioned by Pearse (1938, p. 77) as collected at St. Josephs Bay, Fla., March 28, 1936. The drawing, fig. 4, pl. 20, in Pearse and Littler labeled *Leptoplana angusta* is also *Digynopora americana.* This drawing purports to represent a Beaufort polyclad, but actually the individual from which the drawing was made is the type specimen of *Digynopora americana*, from Florida. The species from around Beaufort which Pearse and Littler confused with the Florida form is *Euplana carolinensis*, described above.

The presence of a ductus vaginalis, i. e., a canal leading from the vagina to an accessory external opening or looping back to reenter the vagina near the regular genital pore, is not uncommon in acotylean polyclads. Bock (1925) has discussed its occurrence and has pointed out that this condition is particularly apt to develop in the families Leptoplanidae and Stylochidae. Genera with a ductus vaginalis lack Lang's vesicle. Three leptoplanid genera have already been based on the presence of a ductus vaginalis. These are *Tripylocelis* Haswell, 1907, in which the ductus opens externally by a pore behind the regular female pore and the male apparatus resembles *Euplana; Copidoplana* Bock, 1913, with a similar ductus vaginalis, and male apparatus as in *Notoplana;* and *Ceratoplana* Bock, 1925, in which the ductus makes a loop, reentering the vagina, and the male apparatus resembles that of *Stylochoplana.* I had

hoped to avoid making a new genus for the present species by placing it in an existing leptoplanid genus with a ductus, but it does not seem to fit well enough into any of the three mentioned, although it is fairly similar to *Ceratoplana*. It differs from this genus in that it lacks tentacles and the ductus vaginalis opens separately instead of looping back into the vagina. Altogether it has seemed best to create a new genus for the species.

Family HOPLOPLANIDAE Stummer-Traunfels, 1933

Definition.—Schematommata of oval form, usually with tentacles; penis consists of a stylet fastened directly to the prostatic vesicle; true seminal vesicle absent; instead there are strongly developed accessory seminal vesicles; no Lang's vesicle.

Genus HOPLOPLANA Laidlaw, 1902

Definition.—With the characters of the family.

HOPLOPLANA INQUILINA (Wheeler 1894)

Planocera inquilina WHEELER, 1894, p. 196, fig. 1.
Hoploplana inquilina BOCK, 1913, p. 228.—HYMAN, 1939a, p. 145, figs. 12, 13.

Material.—Two whole mounts and two sets of serial sections in Pearse collection.

Form.—Oval, flat, 6 mm. long by 4 mm. wide, with pointed conical tentacles (see figure in Wheeler, 1894, p. 197).

Eyes.—Cluster of tentacular eyes in and around tentacle bases of about 15 eyes each; loose cerebral clusters of 6–10 eyes extending forward from the brain.

Color.—Pale, translucent, with a reticulum of granules white by reflected, black by transmitted light.

Digestive tract.—Pharynx central, broadly oval, ruffled, with wide ruffled folds; intestinal branches radiating to periphery with small lateral branches, not anastomosed.

Reproductive system.—Described by Wheeler (1894), some points added by Hyman, 1939a (figs. 12, 13, p. 145). What Wheeler called the penis is the prostatic vesicle, to which the small pointed penis stylet is directly fastened; prostatic vesicle spherical with thick muscular wall and small glandular center. Vasa deferentia greatly expanded with thick muscular walls, serving as accessory seminal vesicles; common ejaculatory duct formed by their union penetrates prostate to base of penis stylet.

Distribution.—Recorded only from Woods Hole, Mass.

Habits.—Sluggish, creeping slowly, commensal in the mantle cavity of the snail *Busycon*.

HOPLOPLANA INQUILINA THAISANA Pearse, 1938, new combination

Hoploplana thaisana PEARSE, 1938, p. 79, fig. 28.

Material.—One whole mount, labeled *Hoploplana thaisana*, type, U. S. N. M. No. 20189.

Form.—Oval, flat, 1 to 3 mm. long, 0.7 to 2.1 mm. broad; with conical tentacles.

Eyes.—Eyes, 10–26 around and in each tentacle base; 2–11 eyes in each cerebral group. Pearse claims the tentacular group is rounded in *H. thaisana* and horseshoe-shaped in *H. inquilina.* Wheeler's figure fails to show any difference from Pearse's of *H. thaisana* (Pearse, 1938, fig. 28) in this regard. In the two whole mounts of *H. inquilina* available to me at the present writing, the tentacular eyes do show a somewhat semicircular grouping but whether this arrangement is constant can be determined only by examination of large numbers of both forms.

Color.—Not stated by Pearse.

Digestive tract.—As in *H. inquilina;* claim of Pearse that the bases of the pharynx folds are less lobulated in *thaisana* than in *inquilina* could not be substantiated by comparison of the available specimens.

Reproductive system.—Only briefly mentioned by Pearse; what he calls the seminal vesicle is the prostate. As there was but the one specimen of *thaisana* in the collection I have forborne to section it. Attempts to obtain additional material proved futile. As far as I can determine from examination of the stained type specimen, the copulatory complex is identical with that of *H. inquilina.*

Distribution.—St. Vincent Bar, Apalachicola Bay, Fla.

Habits.—Commensal in the snail *Thais floridana floridana;* also found with oysters and barnacles.

Remarks.—In so far as can be determined from the available data and material, *H. thaisana* differs from *H. inquilina* only in its smaller size and in its commensalism with a different snail host. I am therefore of the opinion that it is at best a geographical subspecies and hence should be named *H. inquilina thaisana.*

Family PLANOCERIDAE Lang, 1884 (emend. Bock, 1913)

Definition.—Schematommata with a cirrus; cirrus sac lined by spines, hooks, or ridges eversible to the exterior, or a long cuticularized papilla may be present; often with tentacles; true or accessory seminal vesicles; prostate free or interpolated; vagina often highly muscular; uteri not confluent anterior to the pharynx.

Genus GNESIOCEROS Diesing, 1861

Pelagoplana Bock, 1913.

Definition.—Planoceridae with oblanceolate pellucid bodies; with tentacles containing eyes; with true seminal vesicle and interpolated prostatic vesicle; cirrus armed with parallel toothed bands; vagina with a powerful musculo-glandular fold; Lang's vesicle transverse.

GNESIOCEROS FLORIDANA (Pearse, 1938), new combination

Imogine oculifera Verrill, 1892, p. 475, pl. 40, fig. 1 (not *I. oculifera* Girard, 1853).
Stylochoplana floridana Pearse, 1938, p. 77, fig. 27.—Pearse and Littler, 1938, pl. 20, fig. 5; pl. 22, figs. 14, 15, 17.
Stylochoplana oculifera Pearse and Walker, 1939, p. 18, fig. 10.
Gnesioceros verrilli Hyman, 1939a, p. 146, figs. 14–16.

Material.—Many whole mounts and one set of serial sections in Pearse collection, labeled *Stylochoplana floridana*, including type.

Form.—Oblanceolate, anteriorly expanded, tapering to a pointed posterior end (see Hyman, 1939a, fig. 14, p. 145; also Pearse and Littler, 1938, pl. 20, fig. 5); small, 6–8 mm. long; with a pair of elongate, pointed tentacles.

Eyes.—Each tentacle contains 4–10 eyes; loose cerebral groups of 8–20 eyes each lie between the tentacles extending before and behind their level.

Color.—Translucent greenish.

Digestive tract.—Pharynx elongate, central, with moderate ruffles; intestinal branches greatly anastomosed, forming a reticulum with rounded meshes.

Reproductive system.—Fully described and figured in Hyman, 1939a, figs. 15, 16. Pearse's figure and description (1938, p. 77, fig. 27) contain errors; the uteri are not confluent anterior to the pharynx; Lang's vesicle is transversely crescentic, not globular. It is correctly shown in Pearse and Littler, fig. 14, pl. 22, where, however, it is labeled seminal receptacle, and the prostate is labeled efferent duct. The cirrus is figured by Pearse and Littler, fig. 15, pl. 22, but I am unable to understand the long strands shown coursing through the cirrus. I have never in many specimens studied seen any such structures. In Pearse and Littler's fig. 17, pl. 22, the prostate is called penis and the seminal vesicle is called prostate. Their sagittal section, fig. 21, pl. 23, is in error in that a common genital pore is indicated; the species has separate genital pores.

The genus *Gnesioceros* has a cirrus composed of parallel toothed bands eversible to the exterior. There is an elongated cylindrical prostate made of a succession of transverse chambers and enclosed in the same muscular sheath as the cirrus. The thick musculoglan-

dular vaginal fold characteristic of the genus is present in only the anterior vaginal wall in *G. floridana.*

Distribution.—Florida to Massachusetts, common in the southern part of the range.

Habits.—Among seaweeds, quick, active, may swim to some extent.

Remarks.—Pearse placed this species in the wrong family and genus. In Pearse and in Pearse and Littler the species is called *Stylochoplana floridana*, and in Pearse and Walker the name *Stylochoplana oculifera* is used, apparently for the same species. As I pointed out (Hyman, 1939a), Verrill saw a specimen of this species at Quisset Harbor near Woods Hole and mistakenly identified it as *Imogine oculifera* Girard. I therefore gave the animal a new name, *Gnesioceros verrilli*, but as Pearse's publication antedates mine, it is necessary to alter the name to *Gnesioceros floridana.*

PLANCTOPLANELLA, new genus

Definition.—Planoceridae without true seminal vesicle; interpolated prostate with transverse chambers as in *Gnesioceros;* cirrus sac with thick muscular wall and vermiform cirrus papilla as in *Planctoplana;* Lang's vesicle absent.

Type.—*P. atlantica*, new species.

PLANCTOPLANELLA ATLANTICA, new species

FIGURES 29, *d;* 30

Material.—Four specimens in vial sent by U. S. National Museum, serial sections made of sexual region of one of them.

Form.—Egg-shaped (fig. 30, *a*), posterior end broadest, to 8.5 mm. long by 4 mm. wide (preserved); no evident tentacles, but their absence is not certain, as no suitable sections are available to determine this point.

Eyes.—Small, all of the same size, tentacular clusters not very distinct from cerebral groups; eyes loosely arranged, extending behind and in front of the brain (fig. 29, *d*).

Color.—Preserved specimens white, probably translucent in life.

Digestive tract.—Pharynx small, central, with a few folds (fig. 30, *a*); intestine dendritic, anastomosed.

Reproductive system.—Enlarged vasa deferentia along posterior half of pharynx (fig. 30, *a*) have thin muscular coats, hence form moderately developed accessory seminal vesicles. They enter separately the anterior end of the prostate, so that a true seminal vesicle is absent. Prostate (fig. 30, *c*) as in *Gnesioceros*, elongate with transverse glandular chambers and thick muscle coat. The chambers are lined with eosinophilous gland cells borne on connective tissue parti-

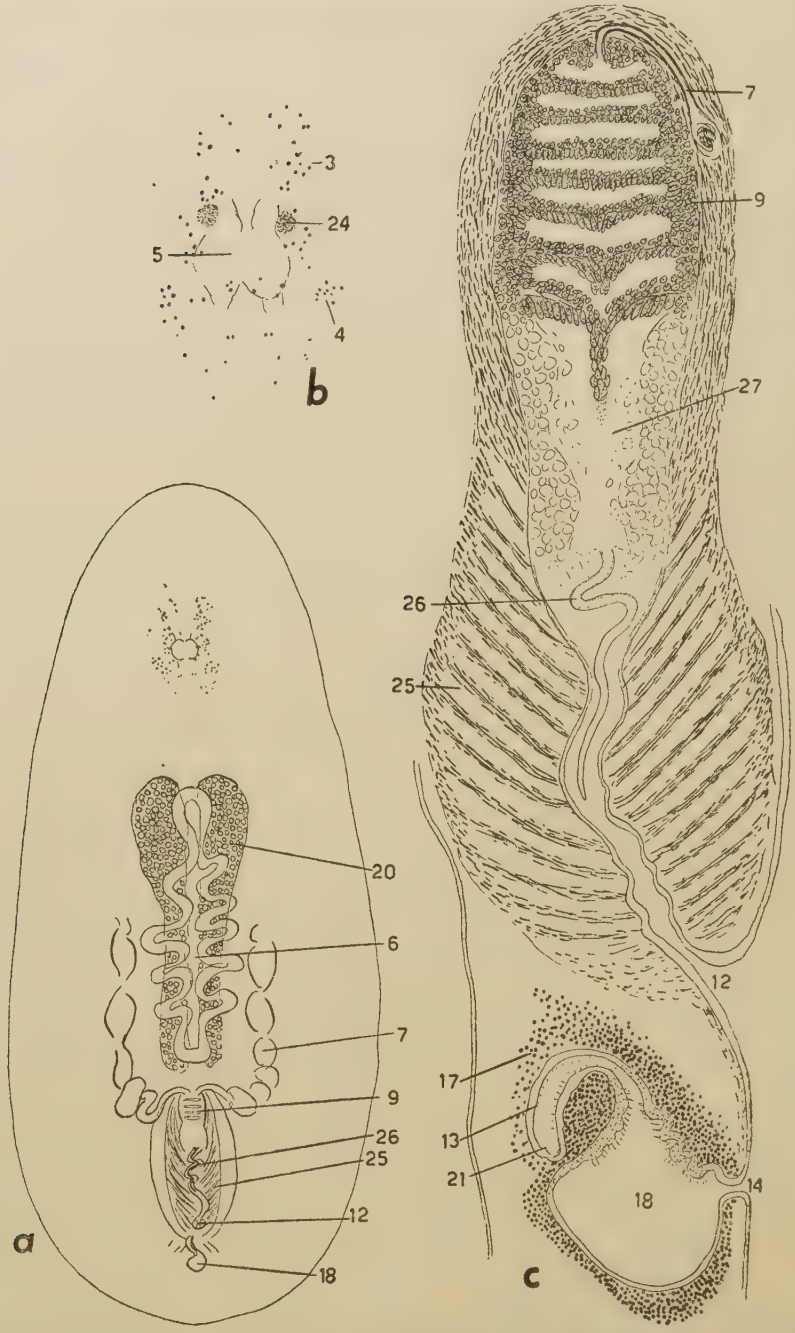

FIGURE 30.—*a*, *Planctoplanella atlantica*, new genus and species, type; *b*, eyes of *P. atlantica*, same specimen as fig. 30, *a*; *c*, copulatory complex of *P. atlantica*, from sagittal sections made from sexual region of specimen shown in fig. 30, *a*. (See p. 492 for index to numbered parts.)

tions. The prostate continues directly into a chamber lined by an indefinite tissue containing large cyanophilous masses (fig. 30, *c*), and this is continuous with the cirrus sac. Latter has thick muscular wall of radiating fibers and sinuous canallike lumen, which contains the vermiform cirrus papilla, a long slender sinuous structure, which takes its origin from the cyanophilous chamber just mentioned (fig. 29, *a*). Cirrus papilla appears to have no cellular structure but to be a hollow tube with a cuticularized wall. It is filled with eosinophilous granules, apparently coming from the prostate. Lumen of cirrus sac lined by ordinary epithelium; no cuticularized structures, except the cirrus papilla, could be found in male apparatus.

Female pore separate from, shortly behind male pore; leads into nonmuscular vagina greatly expanded into cement pouch, surrounded by numerous cement glands (fig. 30, *c*). Anterior wall of cement pouch has thickened sinuous epithelium, which receives most of cement glands; from this region vagina continues dorsally as a narrowed tube, which curves backward and receives uteri at its posterior end; Lang's vesicle lacking. Uteri form enlarged canals alongside pharynx, stuffed with eggs (fig. 30, *a*).

Distribution.—Taken in surface tow, 8:30–9:00 p. m., no date, Sheepshead Shoal, off Beaufort, N. C.

Habits.—Pelagic, presumably benthonic part of the time.

Type.—Whole mount, sexual region as serial sections, U.S.N.M. No. 20534; other three specimens also mounted, deposited in U. S. National Museum.

Remarks.—The male apparatus of this genus combines the characteristics of *Gnesioceros* and *Planctoplana*. The prostate with its transverse chambers closely resembles that of *Gnesioceros*, and the thick-walled cirrus sac with its canallike lumen containing a vermiform cirrus papilla suggests *Planctoplana*. In *Planctoplana*, according to Graff (1892), the cirrus papilla ("penis") has the usual histological structure but is covered and lined by a cuticularized ("chitinized") layer; in *Planctoplanella* the cirrus papilla seems to consist merely of a cuticularized tube. Unlike other genera of the Planoceridae, *Planctoplanella* is devoid of any armature of either the male or female apparatus, unless the cirrus papilla be considered as such. The powerful musculature of the cirrus sac indicates that this structure everts in copulation, bringing the cirrus papilla to the exterior.

Family ENANTIIDAE Graff, 1890

Definition.—Schematommata with tubular pharynx in anterior part of body, directed forward; tentacles absent; body margin with cuticular spines; copulatory complex immediately behind pharynx; one or two pairs of laterally extending uteri; Lang's vesicle present.

Genus ENANTIA Graff, 1890

Definition.—With the characters of the family.

ENANTIA PELLUCIDA (Pearse, 1938), new combination

Figure 31, *a*, *b*

Acerotisa pellucida PEARSE, 1938, p. 90, fig. 33.

Material.—Two whole mounts in Pearse collection labeled *Acerotisa pellucida*, one the type; other cut into sagittal serial sections.

Form.—Oval, flat, thin, delicate (see Pearse, 1938, fig. 33); size of preserved specimens given in Pearse as 7.1 by 4.3 mm. and 5.7 by 3.8 mm. No tentacles; no sucker. Margin, except anterior end, with yellow cuticular spines; in the remaining whole mount only three such spines can be seen, close together near the posterior end on one side; presumably the others have been lost. In the set of sections, about 40 such spines appear to have been present. Evidently *E. pellucida* has fewer marginal spines than *E. spinifera*. As Graff (1890) has fully described and illustrated the structure of these spines, an account of them here appears superfluous.

Eyes.—Pearse's figure and description erroneous; no marginal eyes; eyes small, in usual tentacular and cerebral groups (fig. 30, *a*, same specimen as Pearse's figure 33). Tentacular groups of about eight eyes, cerebral groups scattered, of about 10 eyes, extending forward from brain; on each side there is an eye behind each tentacular cluster.

Color.—Pale, whitish, pellucid.

Digestive tract.—Pharynx (fig. 30, *a*) short, tubular, directed forward, in anterior body fifth; from this main intestinal trunk extends posteriorly in median line, giving off a few large branches, which branch and anastomose.

Reproductive system.—Very similar to that of *E. spinifera*. Male complex immediately behind pharynx; male canal leads dorsally from male genital pore into pyriform mass, marked off from parenchyma by a muscle layer. This mass contains in its anterodorsal part the seminal vesicle, which has a muscular wall and receives from below separately the two vasa deferentia (fig. 30, *b*). Seminal vesicle discharges into a cavity containing the introverted penis papilla. The male system of *E. pellucida* thus differs from that of *E. spinifera* chiefly in that in the latter the penis is protruded, in the former introverted, probably merely a functional difference. Prostate appears entirely wanting.

Female genital pore shortly behind male pore (fig. 31, *b*); leads into long vagina, which extends posteriorly in median line, has a kink where the shell glands enter, posterior to this receives a pair of uteri, and then continues as an elongated Lang's vesicle (fig. 31, *a*,

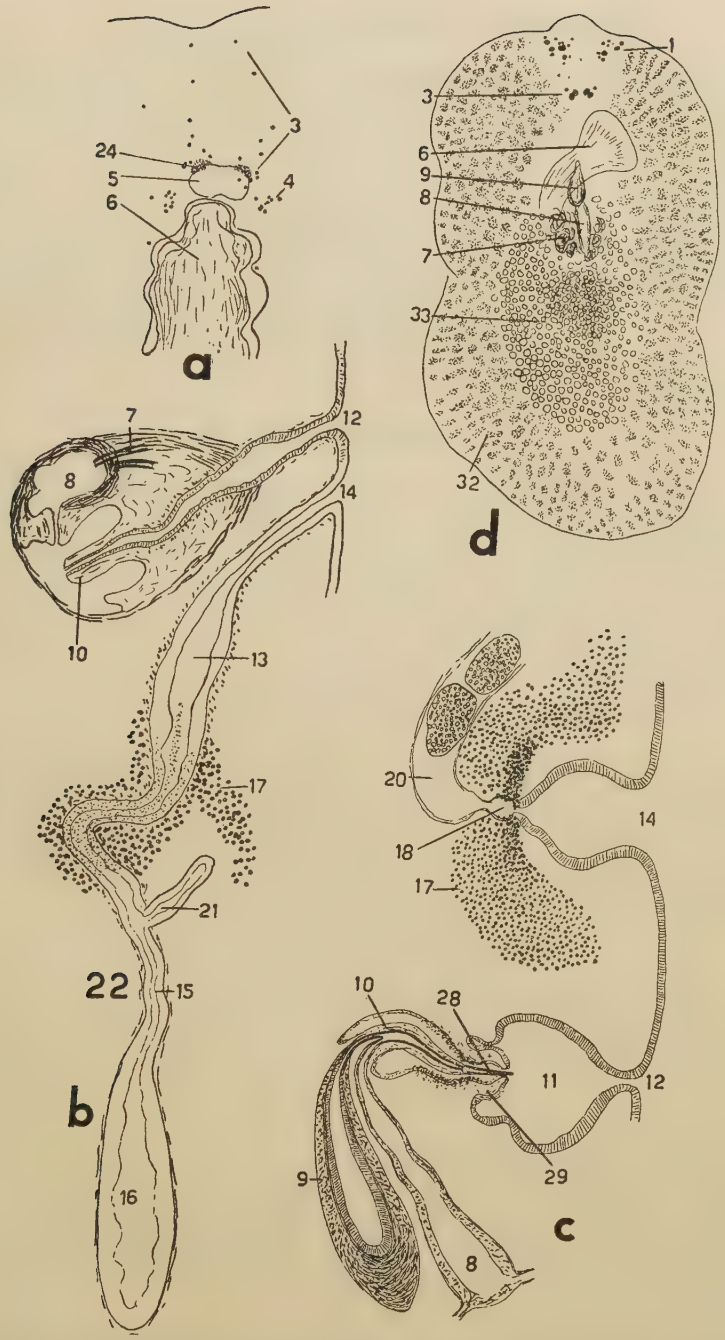

FIGURE 31.—*a*, Eye arrangement of *Enantia pellucida* (Pearse), from Pearse's whole mount, U.S.N.M. No. 20193; *b*, copulatory complex of *E. pellucida*, from sagittal sections made of Pearse's whole mount No. 307A; *c*, copulatory complex of *Oligoclado floridanus* Pearse, from set of sagittal sections in Pearse collection, No. 419; *d*, *Acerotisa baiae*, new species, from Pearse's whole mount No. 430 (which has been sectioned). (See p. 492 for index to numbered parts.)

for dorsal view see Pearse's figure 33). Differs from *E. spinifera* in that there is a single pair of uteri, whereas latter has two pairs.

Distribution.—St. Vincent Bar, Apalachicola Bay, Fla.

Habits.—Not stated by Pearse.

Remarks.—Pearse regarded this species as a cotylean and therefore attributed to it a sucker, marginal eyes, and a prostate vesicle, which do not exist; he entirely overlooked the marginal spines. This species is so similar to the only other known species of the genus and family, *E. spinifera* Graff (1890), that it may be placed without hesitation in that genus. Distinctions from *E. spinifera* are noted above.

Suborder COTYLEA

Definition.—Polyclads with a sucker behind the female genital pore; tentacles when present of the marginal type; eyes on anterior margin in two groups, extending on tentacles when present; or eyes in a band along anterior margin; pharynx ruffled to tubular; uteri usually behind female genital pore; prostate when present always free; Lang's vesicle absent.

Family PSEUDOCERIDAE Lang, 1884

Definition.—Cotylea of considerable size and oval shape; tentacles broad and blunt, formed of marginal folds, bearing eyes; pharynx ruffled; gut branches numerous and anastomosed; male copulatory apparatus single or double, with a penis stylet and free prostatic vesicle; uteri branched; uterine glands often present.

Genus THYSANOZOON Grube, 1840

Definition.—Pseudoceridae in which the dorsal surface bears numerous papillae each of which contains a gut branch; male apparatus double (paired).

THYSANOZOON NIGRUM Girard, 1851

Thysanozoon nigrum Girard, 1851, p. 137.

Material.—Two specimens taken alive at Bermuda.

Form.—Elongated-oval shape, narrowing at anterior end to the two projecting marginal tentacles; dorsal surface with numerous papillae with rounded tips; 25–30 mm. long, 8 mm. wide when extended in locomotion.

Eyes.—Rounded cluster of cerebral eyes in median line just in front of anterior end of pharynx; eyes on tentacles indistinguishable because of black color.

Color.—Velvety black above; may have a few white flecks; dusky below.

Digestive tract.—Oval ruffled pharynx in anterior half; mouth anterior to center of pharynx.

Reproductive system.—Described in Hyman, 1939b.

Distribution.—Florida, Bermudas.

Habits.—Among stones; also swims.

Remarks.—This species was described by Girard from the eastern coast of Florida. Although it has not since been taken there, it probably still occurs. It is found sparingly at Bermuda along the causeway between Longbird and Castle Islands.

?THYSANOZOON BROCCHI (Risso, 1818)

Tergipes brochi Risso, 1818, p. 373.
Thysanozoon brocchi Grube, 1840, p. 55.—Pearse, 1938, p. 85.

Pearse (1938, p. 85) records collecting 15 specimens of a "papillate polyclad" which he identified as *Thysanozoon brocchi*, among eelgrass in Crooked Island Sound, Farmdale, Fla. Although the facts that *T. brocchi* has a wide distribution and that other Mediterranean pseudocerids occur at Bermuda make this identification at least plausible, it cannot be accepted as certain without a more detailed study. I have been unable to obtain any specimens for study.

Genus PSEUDOCEROS Lang, 1884

Definition.—Pseudoceridae without dorsal papillae, or if such are present they do not contain gut branches; otherwise very similar to *Thysanozoon*: male copulatory apparatus single or paired.

PSEUDOCEROS MACULOSUS Pearse, 1938

Pseudoceros maculosus Pearse, 1938, p. 85, fig. 31.

Material.—One whole mount, type specimen.

Form.—Elongated oval, flat, 17 mm. long by 7 mm. wide in life; dorsal surface stated to have been roughened in life by small, low, conical papillae, more numerous toward the median line; these not detectable on whole mount. For general appearance, see Pearse (1938, fig. 31).

Eyes.—Cerebral eyes in paired semicircular clusters close together (Pearse, 1938, fig. 31D). Many tentacular eyes on medial lobe of each tentacle and median region directly behind tentacles.

Color.—Stated by Pearse to be gray with middorsal light band bordered by darker shade; small dark spots scattered evenly over the dorsal surface.

Digestive tract.—Pharynx oval, ruffled, in anterior body third, mouth central in pharynx, large main gut extends back from pharynx to about one-fourth the distance from the posterior end, giving off numerous (about 60) branches on each side, which anastomose to a network.

Reproductive system.—As only the type specimen is available, I have forborne to section it. Without sections it is impossible to furnish any details of the reproductive system beyond those given by Pearse. His figure 31B of the male copulatory apparatus appears to be correct, but as regards the female apparatus I was unable to see on the whole mount the two uterine glands which he figures.

Distribution.—Crooked Island Sound, Farmdale, Fla.

Family EURYLEPTIDAE Lang, 1884

Definition.—Cotylea with pointed marginal tentacles, or tentacles reduced or lacking; pharynx tubular, anteriorly located, directed forward; male apparatus single, immediately behind or beneath the pharyngeal pocket; penis with stylet; uteri form a pair of large unbranched canals along the main gut; uterine glands few, often but two, or lacking.

Genus EURYLEPTA Ehrenberg, 1831 (emend. Lang)

Definition.—Main gut with a few (mostly three to five) branches on each side, usually not anastomosing; tentacles well developed; uterine glands usually one pair; mouth behind brain.

EURYLEPTA MACULOSA Verrill, 1893

Eurylepta maculosa Verrill 1893, p. 495, pl. 41, figs. 2, 3.—Pearse, 1938, p. 87.—Hyman, 1939a, p. 150, figs. 17, 18.

Material.—Three whole mounts made by Pearse from specimens collected by Verrill; one marked type is intact, others labeled cotypes are fragmentary.

Form.—Elliptical or oblong, thin, changeable, with thin undulated margin, 10–12 mm. long; tentacles long, bluntly pointed.

Eyes.—For figure see Hyman, 1939a, fig. 17, p. 149. Cerebral eyes in paired elongated clusters continuing as scattered eyes to anterior margin; tentacular eyes borne on lower halves of anterior faces of tentacles.

Color.—Mottled brown or purplish brown on a pale yellowish or flesh ground.

Digestive tract.—Pharynx short, tubular; main gut with about three pairs of lateral branches.

Reproductive system.—In the absence of a good specimen for serial sections, I have nothing to add to my previous account and figure (Hyman, 1939a, fig. 18, p. 149).

Distribution.—Vicinity of Woods Hole, Mass., rare.

Habits.—On piles, in mud, and among algae.

Remarks.—This species must remain imperfectly known until well-preserved material suitable for sectioning shall be forthcoming.

Genus OLIGOCLADO Pearse, 1938

Hymania PEARSE and LITTLER, 1938.

Definition.—Euryleptidae with a uterine duct on each side lateral to the uteri, running from the uterine gland to a median uterine pore directly behind the blind end of the main gut; vasa deferentia confluent behind the uterine pore; otherwise as in *Eurylepta.*

OLIGOCLADO FLORIDANUS Pearse, 1938

FIGURE 31, *c*

Oligoclado floridanus PEARSE, 1938, p. 88, fig. 32.—PEARSE and LITTLER, 1938, p. 241, pl. 20, fig. 8.
Hymania prytherchi PEARSE and LITTLER, 1938, p. 239, pl. 21, figs. 10–13.

Material.—Number of whole mounts, some labeled *Oligoclado floridanus*, others *Hymania prytherchi*, one set of serial sections labeled *Hymania prytherchi*, five living specimens sent from Beaufort by Dr. Pearse.

Form.—Oblong, ends rounded, or anterior end somewhat truncate, very changeable, maximum length when crawling 29 mm., width 12 mm.; tentacles long, slender, pointed, very mobile (for general appearance see Pearse and Littler, 1938, pl. 21, figs. 10, 11).

Eyes.—Cerebral eyes in paired elongated clusters; eyes on basal half of anterior faces of tentacles and also in a pair of clusters on anterior margin between tentacle bases (Pearse, 1938, fig. 32B; Pearse and Littler, 1938, figs. 11, 12, pl. 21).

Color.—Nearly white with a pinkish tinge and median deeper pink band. The colors ascribed by Pearse to this species in his descriptions of *Oligoclado floridanus* and *Hymania prytherchi* undoubtedly resulted from ingested ascidians. The five living specimens that he sent me and that had had no food for a few days had lost these colors and were almost white. It is even probable that with further starvation the remaining pinkish tints would also disappear.

Digestive system.—Pharynx tubular, mouth at anterior end of pharynx behind brain. Pearse's description of gut erroneous; there is no anus; Pearse and Littler's description of gut of "*Hymania prytherchi*" is correct. The main gut has three to several branches on each side, which may form anastomoses, especially in posterior body half; it ends blindly just in front of the uterine pore.

Reproductive system.—Description by Pearse contains several errors; that by Pearse and Littler of "*Hymania prytherchi*" is substantially correct. The course of the male ducts is correctly figured by Pearse and Littler (fig. 11, pl. 21), but the description is confused. The vasa deferentia are confluent in the posterior part of the body behind the uterine pore; they then course forward as coiled canals on

each side to the level of the posterior end of the pharynx where each turns medially, narrowing to a tube with slightly muscular wall; these enter the proximal end of the seminal vesicle. Seminal vesicle is an elongated tube with dilated proximal end, which receives the vasa deferentia; usually this end is anterior and the vesicle narrows posteriorly to its entrance into the penis; but in one whole mount, the seminal vesicle has the reverse orientation. Vesicle has muscular wall of inner circular and outer longitudinal fibers. Free prostatic vesicle lies close to and parallels seminal vesicle (fig. 31, *c*); is of elongated oval form with muscular wall very thick at free end, thinning towards duct (fig. 31, *c*). Duct of prostate and seminal vesicle join in penis base. Penis as in *Eurylepta*, elongated with terminal stylet and penis sheath; male antrum a large rounded chamber (fig. 31, *c*). Where vasa deferentia are confluent in median posterior region there is, according to Pearse and Pearse and Littler, a small blind diverticulum. I was able to see this on one whole mount, the type specimen of *Oligoclado floridanus*, but not on any of the others, and I was not convinced that it might not be the basal part of a branch collecting from posterior testes. Female pore shortly behind male pore; opens into somewhat expanded female antrum from roof of which narrow canal expands slightly into small cement pouch (fig. 31, *c*). This receives the cement glands, which form a dense eosinophilous halo around the female duct. From cement pouch, short vagina proceeds posteriorly and soon receives on either side a uterus (see Pearse and Littler, 1938, pl. 21, fig. 11). Each uterus is a thin-walled tube stuffed with eggs; it proceeds posteriorly alongside the main gut and terminates blindly near the gut end. According to Pearse and Littler the anterior part of each uterus is bifurcated, but this is probably a trivial variation. It is not shown or mentioned by Pearse in his original description of *O. floridanus*, and I was not able to discern any such condition on the type specimens of *O. floridanus* and "*H. prytherchi*." From the anterior end of each uterus there extends laterally a duct, which opens into a uterine duct, and this in turn connects by a duct with the large saclike uterine gland of that side. There is a pair of uterine glands as in *Eurylepta*. The uterine duct of each side receives a branch from in front and then proceeds posteriorly along the uterus to join its fellow of the opposite side just behind the blind posterior end of the main gut. The common duct so formed turns ventrally and opens in the midventral line by a uterine pore. These relations are figured by Pearse and Littler. The uterine glands have a very tall epithelium underlain by a few muscle strands and seem to serve for holding and digesting excess sex cells. The uterine ducts are lined by a cuboidal epithelium and have a muscle coat chiefly of circular fibers.

Distribution.—Florida to North Carolina.

Habits.—Restless, changeable, on wharf pilings associated with ascidians on which it feeds; also on shells in shallow water.

Remarks.—An examination of the type specimens of *Oligoclado floridanus* and *Hymania prytherchi* as well as of a number of other whole mounts labeled with these names, together with some sets of serial sections, has shown that the two species are identical and hence *H. prytherchi* becomes a synonym of *O. floridanus*. This species is close to *Eurylepta* (not to *Oligocladus* as supposed by Pearse) and in fact differs from *Eurylepta* only in the presence of a pair of uterine ducts, which extend from the uterine glands to a common pore in the rear part of the body. It must be emphasized, however, that these ducts and the pore are present only in the largest, maturest specimens, and individuals that have uteri full of eggs and masses of sperm in the vasa deferentia still may show no traces of them. They apparently appear only when breeding is at its height. Now it is quite possible that these structures also exist in *Eurylepta* and have been overlooked through a lack of fully ripe material. In fact, it must be admitted that the available descriptions and figures of the reproductive system of species of *Eurylepta* are none too satisfactory. I therefore feel that the genus *Oligoclado* does not as yet rest on a firm basis.

Genus ACEROTISA Strand, 1928

Aceros Lang, 1884.

Definition.—Euryleptidae without tentacles, with a pair of eye groups on the anterior margin in the sites of tentacles; with paired cerebral eye clusters of few eyes; male apparatus typically euryleptid; small to minute forms.

ACEROTISA BAIAE, new species

Figure 31, *d*

Material.—One whole mount in Pearse collection, slide No. 430, labeled *Prosthiostomum lobatum?*, cut into serial sections; in very bad condition.

Form.—Roughly oblong (fig. 31, *d*) 3.2 mm. long by 1.8 mm. wide, preserved; without tentacles; sucker could not be found.

Eyes.—Pair of eye clusters on anterior margin, each cluster of about 4 or 5 larger eyes and several very small ones (fig. 31, *d*); cerebral groups consist each of two large eyes, with one or two small ones.

Color.—Unknown.

Digestive tract.—Typical bell-shaped pharynx in usual anterior position, directed forward, torn from its attachment (fig. 31, *d*); intestinal branches could not be discerned.

Reproductive system.—Specimen fully mature but reproductive system much damaged; center of specimen filled with a mass of eggs, apparently from ruptured uteri; periphery showed numerous testes (fig. 31, *d*). Beneath and behind pharynx male copulatory apparatus could be seen in whole mount; sections showed it to be typical of the genus *Acerotisa*, but stylet, male antrum, and penis sheath were missing. Penis below pharynx; penis papilla elongated; free prostatic vesicle of oval form with moderately muscular wall; coiled mass of vasa deferentia could be seen around proximal end of seminal vesicle. Nothing of the female apparatus was discernible except a dense cloud of cement glands shortly behind the penis.

Differential diagnosis.—Size, number of eyes in eye clusters, and tubular seminal vesicle serve to distinguish this species.

Distribution.—St. Josephs Bay, Fla.

Type.—One set of serial sections (2 slides), U.S.N.M. No. 20535.

Remarks.—The lack of tentacles, eye arrangement, and euryleptid male apparatus leave no doubt that this species belongs to the genus *Acerotisa*, despite the imperfect condition of the specimen. Bock (1922) has pointed out that cerebral clusters composed of just two large eyes (with or without accompanying small eyes) occur in several cotylean genera (*Stylostomum*, *Acerotisa*, *Chromoplana*) and are also characteristic of young pseudocerids, so that they are probably of ancestral significance. In the genus *Acerotisa* such cerebral clusters are known for *A. inconspicuus* (Lang, 1884), *A. notulata* (Bosc, 1801) (for description see Hyman 1939b), and the present species.

Family PROSTHIOSTOMIDAE Lang, 1884

Definition.—Cotylea of elongate slender form, without tentacles; pharynx in anterior body half, long and tubular, directed forward, mouth at anterior end of pharynx, just behind brain; with a band of eyes along the anterior margin, paired cerebral clusters also present; male copulatory apparatus with two spherical accessory vesicles; penis with a stylet.

Genus PROSTHIOSTOMUM Quatrefages, 1845

Definition.—With the characters of the family.

PROSTHIOSTOMUM LOBATUM Pearse, 1938

Prosthiostomum lobatum PEARSE, 1938, p. 91, fig. 34.

Material.—Many whole mounts labeled *Prosthiostomum lobatum;* set of serial sections made from one of these.

Form.—Slender, elongated, anterior end rounded, posterior end obtusely pointed; maximum length 17 mm., width 2.7 mm. (measured alive by Pearse).

Eyes.—Band along anterior margin usually distinctly paired, narrow median region without eyes; about 30–75 eyes in band on each side; band extends around sides of anterior end to level somewhat behind brain. Cerebral eyes in paired elongated clusters of about 10–20 eyes each (Pearse, 1938, fig. 34).

Color.—Cream color or dirty white, yellowish brown toward median line.

Digestive system.—Figured by Pearse, 1938, fig. 34.

Reproductive system.—One of Pearse's specimens was sectioned, but the sections were so poor that I am not able to add anything to his account and figure of the reproductive system (1938, fig. 34). The members of this genus are almost identical in the details of the sexual system.

Distribution.—Florida to North Carolina.

Habits.—Associated with sponges, shells, oysters, and pile animals.

Remarks.—The species of *Prosthiostomum* are very difficult to distinguish. *P. lobatum* appears to be a valid species of the genus; it differs from most members of the genus in the paired arrangement of the eyes of the marginal band, although this is not evident in every specimen.

SPECIES OF UNCERTAIN POSITION

In this paper all the species of Girard and all but one of the species of Verrill are accounted for and allocated to the proper genera. It is impossible at present to evaluate *Stylochus crassus* Verrill, 1892. It was described from a single specimen taken by the *Albatross* at 6,900 feet off the Maryland coast. As Verrill gave no figures, little can be decided about it until some fortunate chance shall yield another specimen.

INDEX TO NUMBERS ON THE FIGURES

All drawings of eyes were made with the camera lucida. For all the figures (fig. 24–31) the following numbers apply for the various parts illustrated:

1. Marginal eyes.
2. Frontal eyes.
3. Cerebral eyes.
4. Tentacular eyes.
5. Brain.
6. Pharynx.
7. Vas deferens.
8. Seminal vesicle.
9. Prostatic vesicle.
10. Penis papilla.
11. Male atrium.
12. Male genital pore.
13. Vagina.
14. Female genital pore.
15. Stalk of Lang's vesicle.
16. Lang's vesicle.
17. Cement glands.
18. Cement pouch.
19. Common genital pore.
20. Uterus.
21. Entrance of uteri into vagina.
22. Small prostatic apparatuses (adenoids).
23. Large prostatic apparatuses (prostatoids).
24. Mass of granules associated with brain.
25. Cirrus sac.
26. Cirrus papilla.
27. Cyanophilous chamber.
28. Penis stylet.
29. Penis sheath.
30. Ductus vaginalis.
31. Extra female genital pore.
32. Testes.
33. Mass of eggs.

LITERATURE CITED

BERGENDAL, DAVID.

1893. Einige Bemerkungen über *Cryptocelides loveni* mihi. Lunds Univ. Års-Skrift, vol. 29 (Physiogr. Sällsk. Handl., vol. 4, art. 7, 7 pp.).

BOCK, SIXTEN.

1913. Studien über Polycladen. Zool. Bidrag Uppsala, vol. 2, pp. 31–344, 67 figs., 8 pls.

1922. Two new cotylean genera of polyclads from Japan and remarks on some other cotyleans. Arkiv. Zool., vol. 14, pp. 1–31, 2 pls.

1925. Planarians, pts. 1–3. Paper No. 25 from Dr. Th. Mortensen's Pacific Expedition, 1914–16. Vid. Medd. Dansk Naturh. Foren. København, vol. 79, pp. 1–84, 3 pls.

DIESING, KARL MORITZ.

1861. Revision der Turbellarien. Abtheilung: Dendrocoelen. Sitzber. Akad. Wiss. Wien, math.-nat. Klasse, vol. 44, pp. 485–578.

GIRARD, CHARLES FRÉDÉRIC.

1850. Descriptions of several new species of marine Planariae from the coast of Massachusetts. Proc. Boston Soc. Nat. Hist., vol. 3, pp. 251–256, 264–265.

1851. Description of a new Planaria and a new Nemertes from the coast of Florida. Proc. Boston Soc. Nat. Hist., vol. 4, p. 137.

1853. Descriptions of new nemerteans and planarians from the coast of the Carolinas. Proc. Acad. Nat Sci. Philadelphia, vol. 6, pp. 365–367.

1854. *In* William Stimpson: Synopsis of the marine Invertebrata of Grand Manan or the region about the mouth of the Bay of Fundy, New Brunswick. Smithsonian Contr. Knowl., vol. 6, pp. 27–28, 1 pl.

1893. Recherches sur les planariés et les némertiens de l'Amerique du Nord. Ann. Sci. Nat., ser. 7, vol. 15, pp. 145–310, 4 pls.

GRAFF, LUDWIG VON.

1890. *Enantia spinifera*, der Repräsentant einer neuen Polycladen-Familie. Mitt. nat. Verein. Steiermark, vol. 26, pp. 3–16, 1 pl.

GRUBE, ADOLPH EDUARD.

1840. Actinien, Echinodermen und Würmer des Adriatischen und Mittelmeers nach eigenen Sammlungen beschreiben, 92 pp., 1 pl. Königsberg.

HASWELL, WILLIAM AITCHESON.

1907. Observations on Australasian polyclads. Trans. Linn. Soc. London, vol. 9, pp. 465–485, 3 pls.

HYMAN, LIBBIE HENRIETTA.

1939a. Some polyclads of the New England coast, especially of the Woods Hole region. Biol. Bull., vol. 76, pp. 127–152, 5 pls.

1939b. Acoel and polyclad Turbellaria from Bermuda and the *Sargassum*. Bull. Bingham Oceanogr. Foundation, vol. 7, art. 1, 26 pp., 9 pls.

LAIDLAW, FRANK FORTESCUE.

1902. The marine Turbellaria, with an account of the anatomy of some of the species. Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, pt. 3, pp. 282–312, 2 pls.

1903a. On a collection of Turbellaria Polycladida from the Straits of Malacca. (Skeat Expedition, 1899–1900.) Proc. Zool. Soc. London, 1903, pt. 1, pp. 301–318, 7 figs., 1 pl.

1903b. Suggestions for a revision of the classification of the polyclad Turbellaria. Mem. and Proc. Manchester Lit. and Philos. Soc., vol. 48, pt. 1, No. 4, 16 pp., 5 figs.

LANG, ARNOLD.

1884. Die Polycladen (Seeplanarien) des Golfes von Neapel. Fauna und Flora des Golfes von Neapel, monogr. 11, 688 pp., 54 figs., 39 pls.

MEIXNER, ADOLF.

1907. Polycladen von der Somaliküste, nebst einer Revision der Stylochinen. Zeitschr. wiss. Zool., vol. 88, pp. 385–498, 2 figs., 5 pls.

MÜLLER, OTTO FREDERIK.

1776. Zoologiae Danicae prodromus, seu Animalium Daniae et Norvegiae indigenarum characteres . . . , xxxii + 282 pp.

ØRSTED, ANDERS SANDØE.

1843. Forsøg til en ny classification af Planarierne (Planariea Dugès) grundet paa mikroskopisk-anatomiske undersøgelser. Naturh. Tidsskr., vol. 4, pp. 519–582.

1845. Fortegnelse over dyr, samlede i Christianifjord ved Drøbach fra 21–24 Juli 1844. Naturh. Tidsskr., new ser., vol. 1, pp. 400–427, 1 pl.

PALOMBI, ARTURO.

1931. *Stylochus inimicus* sp. nov. Polyclade acotileo commensale di *Ostrea virginica* Gmelin delle coste della Florida. Boll. Zool., vol. 2, pp. 219–226, 4 figs., 1 pl.

1936. Policladi liberi e commensali raccolti sulle coste del Sud Africa, della Florida e del Golfo di Napoli. Arch. Zool. Ital., vol. 23, pp. 1–45, 27 figs., 1 pl.

PEARSE, ARTHUR SPERRY.

1938. Polyclads of the east coast of North America. Proc. U. S. Nat. Mus., vol. 86, pp. 67–98, 13 figs.

PEARSE, ARTHUR SPERRY, and LITTLER, J. W.

1938. Polyclads of Beaufort, N. C. Journ. Elisha Mitchell Sci. Soc., vol. 54, pp. 235–244, 4 pls.

PEARSE, ARTHUR SPERRY, and WALKER, ALMEDA M.

1939. Littoral polyclads from New England, Prince Edward Island, and Newfoundland. Bull. Mount Desert Island Biol. Lab., 1939, pp. 15–22, 1 fig.

PEARSE, ARTHUR SPERRY, and WHARTON, GEORGE WILLARD.

1938. The oyster "leech," *Stylochus inimicus* Palombi, associated with oysters on the coast of Florida. Ecol. Monogr., vol. 8, pp. 605–655, 37 figs.

PLEHN, MARIANNE.

1896. Neue Polycladen, gesammelt von Herrn Kapitän Chierchia bei der Erdumschiffung der Korvette Vettor Pisani, von Herrn Prof. Dr. Kükenthal im nördlichen Eismeer und von Herrn Prof. Dr. Semon in Java. Jen. Zeitschr. Naturw., vol. 30, pp. 137–176, 6 pls.

RISSO, ANTOINE.

1818. Mémoire sur quelques gastéropodes nouveaux, nudibranches et tectibranches, observés dans la mer de Nice. Journ. Phys., Chimie, Hist. Nat., et Arts, vol. 87, pp. 368–377.

STIMPSON, WILLIAM.

1857. Prodromus descriptionis animalium evertebratorum quae in expeditione ad Oceanum Pacificum septentrionalem a Republica Federata missa, Johanne Rodgers duce, observavit et descripsit. Proc. Acad. Nat. Sci. Philadelphia, vol. 9, pp. 19–31.

STRAND, EMBRICK.

1928. Miscellanea nomenclatoria zoologica et paleontologica. Arch. Naturg., vol. 92A, pp. 30–75.

STUMMER-TRAUNFELS, RUDOLF VON.

1933. Ergänzende Untersuchungen zum Literatureverzeichnisse. *In* H. G. Bronn's Klassen und Ordnungen des Tier-Reichs, vol. 4, pp. 3485–3566, 138 figs.

VERRILL, ADDISON EMORY.

1873. Report upon the invertebrate animals of Vineyard Sound and adjacent waters, with an account of the physical characters of the region. Rept. U. S. Comm. Fish and Fisher., 1871–72, pp. 295–778, 4 figs., 38 pls.

1882. Notice of the remarkable marine fauna occupying the outer banks of the southern coast of New England, No. 7, and of some additions to the fauna of Vineyard Sound. Amer. Journ. Sci., ser. 3, vol. 24, pp. 360–371.

1892–1893. Marine planarians of New England. Trans. Connecticut Acad. Arts and Sci., vol. 8, pp. 459–520, 2 figs., 5 pls.

WHEELER, WILLIAM MORTON.

1894. *Planocera inquilina*, a polyclad inhabiting the branchial chamber of *Sycotypus canaliculatus* Gill. Journ. Morph., vol. 9, pp. 195–201, 2 figs.

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